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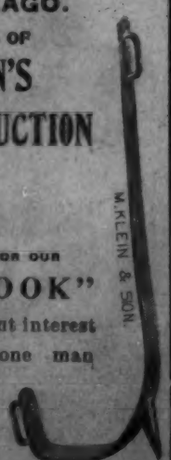

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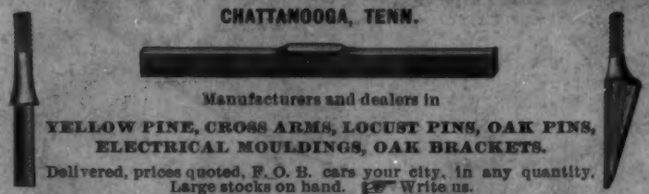

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Telephony.

AN ILLUSTRATED MONTHLY TELEPHONE JOURNAL

VOL. I. CHICAGO, APRIL, 1901. No. 4.

THE OUTLOOK OF THE CEDAR POLE SUPPLY.

BY C. H. WORCESTER.

President of the Northwestern Cedarmen's Association.

Among the millions of people daily using the telephone and telegraph systems of this country there are few whose imagination carries beyond the personal interest involved within their own messages. Only a small minority give any thought to the ways and means by which the transmission of the message is accomplished, and beyond the acquirement of the simple details necessary for each person to acquire before they can take advantage of these wonderful facilities, the majority possess almost no conception of the details of invention, development and operation which have culminated in the results of the systems of to-day. Even among the owners and constructors of these lines there are comparatively few men whose research has given them more than a general knowledge of the materials which they use as they appear in the finished products. The sources of the raw materials and the processes through which these products pass before reaching the finished condition are all interesting to many, but life is short in this busy age and specialization is a growing tendency. The majority of the materials entering into electrical construction are factory made and shaped to fit the exact purpose for which they are intended. The line pole is, however, a marked exception from this majority, and should be regarded from an entirely different standpoint. Nature does not fashion and shape her growths to fit exactly the requirements of the lineman, and to-day, as the forest selection becomes narrowed, it is a question of making the present product answer the purpose rather than making poles to meet the desires of constructors. The supply of poles east of the Missouri River in the United States is rapidly nearing the end, and it is best for all parties concerned that the true conditions should be understood. Probably 90 per cent of the line poles now in use in this country are white cedar. In the eastern and southeastern states chestnut poles are used somewhat, and in the southern states a limited supply of red cedar and cypress poles yearly come into the market; also during the past few years small lots of white cedar poles fifty feet and upward in length have been shipped into the territory east of the Missouri River from Idaho and the Pacific Coast states. With these exceptions, in amount not exceeding 10 per cent, the pole consumption in the territory east of the Rocky Mountains has been supplied from the white cedar swamps of the Great Lakes district. This district comprises the northern half of the southern peninsula of Michigan, all of the upper peninsula of Michigan, northeastern Wisconsin and the islands of the Great Lakes contiguous to this territory. Minnesota is not included in this list on account of the inferior quality of the cedar timber, and the same reason applies to the most of the cedar timber of Canada.

This territory was originally an unbroken forest, the high lands covered with pine, hemlock and a variety of other woods classed by lumbermen as "hard woods," the lower lands and swamps being principally covered with white cedar, spruce and tamarack.

In the early days nothing but pine was considered of value, and up to only a few years ago practically no effort was made to so conduct the cutting of the high-land timber as to conserve preservation of the swamp timber. It has been the practice of most of the lumbering companies in their operations to cut the pine and other woods growing on the higher lands, leaving the swamp timber exposed on all sides to the winds and surrounded by a thick slashing of dry tree tops, branches, etc., which usually took fire in the spring or fall and destroyed a good portion of the swamp timber. The wind has also played great havoc with the cedar where the surrounding timber has been cut away, and as these windfalls, covering in many cases a large territory, become dry, the forest fires complete the work of destruction. Fires and wind storms have destroyed millions of acres of cedar that to-day would be very valuable, while the woodsman's ax and saw have converted into rail-

A FIFTY-FOOT POLE JUST FELLED.

road ties, posts and shingle logs vast quantities of choice timber for pole purposes. Only a small percentage of the trees in a cedar swamp are sufficiently straight, sound and of proper proportions to make poles, the most of the timber being cut up into shingle logs, railroad ties and posts. In the early days the demand for poles was light and easily satisfied from the abundant and choice timber then standing, the result being that a large part of the best cedar stumpage of this district was cut up into railroad ties, logs and posts without a single pole having been produced, where, under conditions of to-day, 20 per cent of the trees would have been made into poles.

With the foregoing in mind, it will be easy for the pole consumer to realize that the production of cedar poles in this territory from now on will be comparatively limited.

A FORTY-FIVE-FOOT POLE PARTIALLY TRIMMED.

While the value of the cedar yet standing is now fully realized, and it is being cared for accordingly, there is only a moderate portion of it which is suitable for pole timber. The expense of producing cedar poles has increased. Labor is much higher. Supplies of all kinds cost more. Where stumpage is tributary to the railroads the sleigh haul is much longer, and during the past year railroad freights have been raised. Much of the cedar timber standing now is not tributary to railroads and must be floated down streams and rivers and concentrated at points which combine railroad and water shipment facilities. In the face of decreasing supply, and increased cost of production, the demand is largely increasing, and consumers must expect that prices will continue to advance until they reach a point which will admit the cedar from the states west of the Rocky Mountains into this territory. To-day the freight on a pole twenty-five feet long, six inches in diameter at the top, from Idaho to Chicago common points, would be close to $1.80, and on thirty-five-foot seven-inch poles about $4.25. Both of these sizes are now being sold for much less than these figures, from the Great Lakes district. So far as poles twenty to fifty feet are concerned, prices must increase fully 50 per cent before the competition of West coast cedar will enter into the situation. The advance in price will occasion an effort toward substitution. In the South greater effort will be made to produce more of the very excellent red cedar poles which grow in small quantities all over the South. This timber makes a rough, knotty pole, frequently very unsightly, but very durable, even more so than white cedar. The production of chestnut poles is now being pushed, but the yield can-

EMPLOYES IN A CEDAR YARD.

not increase beyond its present limits. Young cypress groves produce very sightly, attractive poles, but as compared with white cedar, at much greater cost than present prices, they are not economical on account of their short life. A cypress tree that will shape up a thirty-foot pole is about one-half in diameter sap wood which rots very quickly, limiting the life of a cypress pole to about six years under ordinary conditions. The yellow pine of the South stands in the same class with the Norway pine of the North. Norway poles have in the past been used con-

CEDAR JOBBERS' CAMP, NORTHERN MICHIGAN.

siderably, but their use is now practically abandoned on account of their life being limited according to circumstances to from six to eight years. Southern yellow pine poles are now being creosoted to some extent and through this process this class of timber may be made available to some extent.

It is claimed by some that chestnut poles will last longer than white cedar, their average life being rated at twenty years as against fifteen years for white cedar, but in this comparison it must be borne in mind that chestnut

poles are used almost entirely in the sections where they have grown, while the white cedar poles of the North are distributed from the Atlantic Coast to the Rocky Mountains and from the Great Lakes to the Gulf of Mexico, covering a wide range of climate, spanning the desert and the wind-swept prairies where conditions are very unfavorable. The Western Union Telegraph Company rate the average life of the cedar poles of their entire system at fifteen years. This includes unfavorable and favorable conditions while the life of chestnut poles is computed upon their use almost entirely in favorable localities. It is certain that there is no timber available in anything like sufficient quantity in the United States east of the Rocky Mountains, which will last one-half as long as cedar, which can be substituted when the present supply of white cedar is exhausted. The figures representing the total number of telegraph, telephone, electric light and trolley poles now standing in the United States are interesting. Taking the mileage of the principal telegraph companies of the United States as a basis of computation, we find that in this service alone there are over 7,000,000 poles now standing. No statistics are available, but competent authorities estimate that the poles in the service of the combined city electric light, electric railway and the immense telephone systems of the country will number twice as many more, making a grand total of 21,000,000 poles now standing in the United States.

TRIPLE CARLOAD—STATE OF WASHINGTON CEDAR.

POWER DERRICK AND MILL.

SKIDWAY OF POLES IN THE WOODS.

Assuming that the life of these poles averages fifteen years, the repair work alone on these lines requires 1,400,000 new poles annually. New construction is going forward rapidly in all sections, this class of work last year absorbing over 1,000,000 new poles. It is not claimed that these figures are accurate, but they represent a total consumption of close to 2,500,000 poles annually, and it is the

L. of C.

belief of those very familiar with the subject that the amount is not far from being correct. If the entire production of poles sufficient to meet the demand of this enormous consumption is confined to the Great Lakes producing section, the supply will be exhausted within eight years. However, the writer predicts that fifteen years from this

INTERIOR OF SMALL JOBBERS' CAMP.

date this territory will still produce small quantities of poles, for, as the supply diminishes prices will advance, the cedar of the Pacific Coast states will come into the market east of the Rocky Mountains, iron and steel will be used more extensively each year, and underground construction and possibly wireless telegraphy will largely diminish the present requirements.

While the timber lasts it will be cut every winter in

CEDAR YARD AT A WOODS STATION.

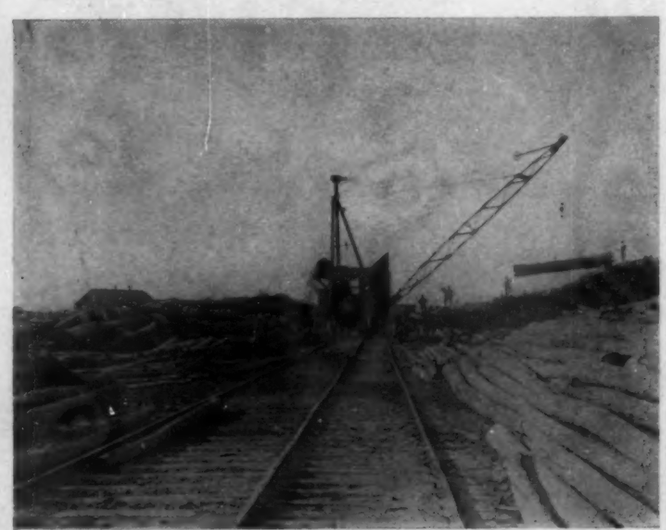
decreasing quantities, and to those who have never visited and personally seen the logging camps of the North, a partial description of the aspect of the country and the circumstances under which the pole supply of the United States is produced may be of interest to the reader.

Board a day train at Menominee, Mich., on the shore of Green Bay, and ride north to Marquette on the shore of Lake Superior, across the northern peninsula of Michigan, a territory which twenty years ago was an almost unbroken forest. The view from the car window will be a revelation to the uninitiated.

The first few hours of the trip will reveal a fairly good farming country, gradually thinning out as the train speeds northward, until the farms are left behind, except in solitary instances. Here little is left of the original forest. The whole land has been in all accessible localities lumbered out and woodland fires have wrought a measureless havoc. Lands once covered with dense forests of pine, hemlock, hardwoods, cedar and tamarack are left a sorry spectacle, the waste land grown up with a dense thicket of birch and poplar, above which tower gaunt, infrequent skeletons of dead, fire-scarred trees. In this trip the pole buyer will not see enough pole timber standing upon the land to build ten miles of light toll line, yet the timber is there. If he will get off at any of the small stations twenty miles or more north of Menominee, and follow the section lines across the country, through the brush, over large areas of sandy plain dotted with the stumps of former forests, miles away from the railroad and its fringe of farms,

A LARGE RAFT OF POLES.

he will begin to see some of the timber which within a year may be supporting copper wire on the plains of Texas. Here and there, scattered throughout the territory, stand isolated groups of green woods, here nearly a whole section of solid timber, the higher lands covered with a mixed growth of pine and hemlock, with occasional groups of hardwoods. In the hollows and swampy lands and bor-



POWER DERRICK USED IN MAIN YARDS.

dering the streams stand clumps of cedar and tamarack. Another one-half mile across a denuded space may bring him into the midst of what was once a fine group of cedar,

say thirty acres of swamp, the trees almost across the group blown flat upon the ground or half fallen, woven together like a pile of jack straws. In the center of the group or under the protecting side of a rising ridge a few acres of green timber may remain. These trees stand to-day, but next month, when the fires commence to run, may all be destroyed. Farther on a ridge of green timber shows. On being reached it is found to be covered with hardwoods surrounded on either side with pine barrens. Follow this ridge, and here and there will be found hollows of varying extent, filled with a rich, luxuriant growth of cedar, protected from wind and fire by the surrounding growth of green hardwoods.

SMALL LOT OF POLES AT RAILROAD STATION.

A SMALL STOCK NICELY SORTED AT RAILROAD POINT.

Here on rising ground, close to a running stream, the cedar jobber builds his log shanty, unless he is fortunate enough to find near by the abandoned camps of some former pine logger. About the first of October the jobbers (usually farmers living at nearest railroad points) load their wagons with the camp outfit and supplies, fit up their camps and the work begins. The trees are felled with ax and saw, extreme care being necessary to fell the tall trees without breaking. Each tree is carefully measured and inspected before cutting up. Many trees will, on account of defects, make nothing but logs, ties and posts, but here and there trees are found sufficiently straight and sound to make poles. These are carefully trimmed of their branches and peeled with the draw shave.

By December the whole swamp is frozen solid, footing is good and horses are brought in to drag the poles, logs, etc., out of the tangle of tops and branches to the roads that have been cut, and when the snow falls the sleighs are loaded and hauling begins. The small operators depend almost wholly upon the snow to make roads for hauling, but where a considerable amount of cedar is being cut or where other logging is being done in connection with the cedar cutting, the whole operation will bear the expense of making ice roads, which make sleigh hauling almost independent of snow.

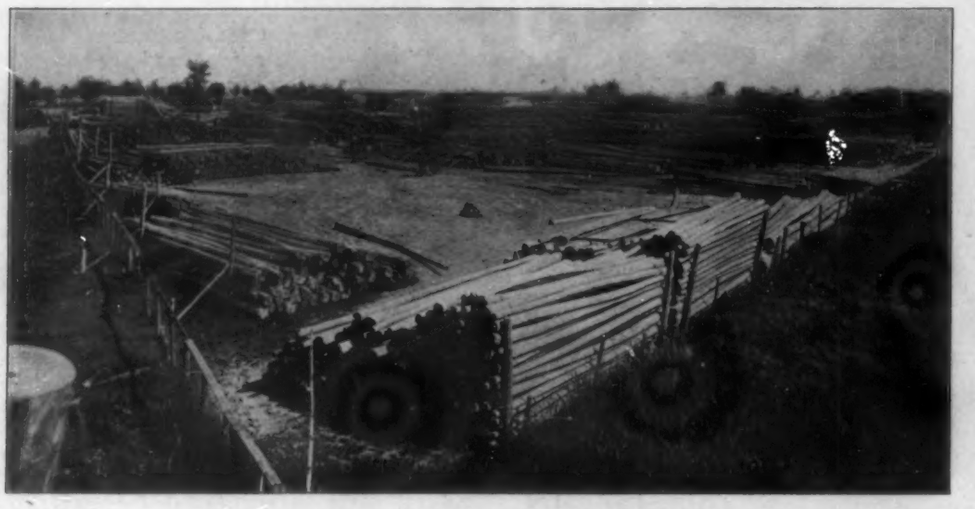
With the advent of spring the woodsman's task is done and the dealer's work commences. At hundreds of small stations and sidetracks on railroads traversing the cedar-producing territory, the result of

2,000 25-FOOT POLES PILED IN FOREGROUND.

the winter's work is piled in lots of from 300 to 5,000 poles, all sizes from sixteen to seventy feet long usually mixed together without regard to size. The small lots of under 2,000 are usuall loaded on cars and shipped to central concentrating points, where in large yards the poles are sorted and piled, each size separately. When sufficiently dry they are then ready for distribution to the trade throughout the country. The larger lots are usually partially sorted at the producing point. Direct shipments are made until the assortment is broken up, then the balance is loaded and shipped to the concentrating yard, where they are sorted up and added to the yard piles.

LOADING AT MAIN YARD.

The larger firms in the business handle from 100,000 up to as high as 200,000 poles annually, equivalent to from 800 to 1,600 carloads, the railroad ties, fence posts and cedar logs produced, with the poles, amounting to twice as much more. A yard which will accommodate all the standard sizes of poles and posts must provide a pile frontage of not less than 1,800 feet, with depth varying from 50 to 150 feet.



A MAIN CONCENTRATING YARD.

The labor involved in the loading, concentrating, sorting and reshipment of a stock of 150,000 poles is enormous and constitutes quite a large proportion of the cost of poles. This expense will increase annually, as it is becoming each year more difficult to secure in one locality stumpage which will produce at one shipping point enough poles so that direct shipments may be made from the stock without concentrating at central points. Where yards are located at the mouths of main logging streams considerable quantities of poles are secured at one point, but in such cases the breakage item is large on account of poles being driven over rapids and lodged in log jams. This, together with driving, towage and handling charges, adds a considerable percentage to the original cost.

Several years ago, following the lead of the lumber dealers, an association was formed among the cedar producers and dealers. This was styled the Northwestern Cedarmen's Association. From a small beginning this association has grown until it includes all the producers and dealers of any importance in the business. It is in no sense a combination, the

SORTING AND LOADING, MAIN YARD.

office of the association being to act as an advisory medium. Meetings are held several times annually, experiences exchanged and matters affecting the interests of its members discussed. The most important benefit resulting from this association has been the almost universal adoption of its standard rules for grading of poles and other cedar products. These rules are now firmly established and disputes between buyer and seller are much less frequent now than formerly. As there is always room for an honest difference of opinion on a question of inspection, and as occasionally either seller or buyer may be incompetent, the association inspectors, whose

LARGE CEDAR POLE YARD.

TRAIN LOAD OF CEDAR POLES EN ROUTE.

experience while in the employ of large users of poles, as Western Union Telegraph Company and Postal Telegraph Company, give them the knowledge necessary for an intelligent decision. These men are subject to call in cases of disagreement on inspection, and up to date many apparently serious differences have been amicably adjusted through their services.

THE ROMANCE OF THE TELEPHONE.

BY JOHN PAUL BOCOCK.

(Concluded.)

The Bell Company was content to allow the Berliner patent to rest in abeyance, since no one else could use a Berliner transmitter under these circumstances. It also owned the patent on a telephone receiver issued to Berliner on November 2, 1880.

At this point in the story of the telephone we encounter Thomas Alva Edison. The marvelous Ohioan, then some thirty years of age, had been getting out electrical patents for ten years past. His genius had attracted the attention of the Western Union Telegraph Company, which offered him a high salary to give the company the right to examine and purchase, if it chose, any and all of his electric inventions. Among other discoveries made about this time was this: That the microphone, or Berliner transmitter, which produces the variations of current in the telephone, worked much better when one or both of the wire ends, or electrodes, as they were called, were made of carbon. From the universal use of carbon in transmitters since Edison's discovery they are now called "carbon transmitters." This was the third discovery contributing virtually to the telephone of to-day.

Now the Western Union at once bought Edison's carbon transmitter invention under its contract. An interference on the loose contact principle having been established by the Patent Office between Edison and Berliner, the latter not having yet joined the Bell company, it also bought Berliner's application. The Western Union people were not slow to realize the full value of the telephone and the growing power of the Bell company. Among others they acquired Gray's rights, Gray being at that time the most conspicuous anti-Bell claimant. In a suit brought by the Bell Telephone Company against one Dowd, who really represented Gray, Gray's rights were fully canvassed and considered. It was urged on behalf of Gray that the Patent Office had defrauded him of his lawful rights by not giving him notice of Bell's application as it had given Bell notice of his (Gray's) caveat. It was even charged that "Bell's patent was surreptitiously issued."

The result of this suit settled forever Gray's claims to the invention of the telephone. He made, through his counsel, a formal admission that "Bell was the first inventor of the telephone." It is said the sum of one hundred thousand dollars was paid to Professor Gray for this admission. The decree, entered by consent of counsel on both sides, not only put Gray on record against the claims of his own caveat—and the claims he has since made again and again—but it had another and even more important effect. It transferred to the Bell Telephone Company absolutely all the Western Union's electrical patents and rights to have patents issued, including the Berliner transmitter, the Edison transmitter, the Page patent, covering the induction coil used in the transmitter; the Short transmitter, the patent on which was awarded to Professor Short, now a distinguished electrical engineer, in an interference, over Edison's contemporary claims; and others still. Four thousand shares of Bell telephone stock passed at this time to the Western Union Telegraph Company. The arrangement practically gave over the telephone field

(Continued on page 115.)

INDEPENDENT TELEPHONY FROM THE STAND POINT OF PUBLICITY.

BY FREDERIC A. DAWES.

For the sake of treating telephony from the standpoint of publicity, the field may be divided into three classes, viz., the manufacturer, the local exchange owner, and the user. If there are any considerable number of people who would not use the telephone, were the same available, such number are of no account and, therefore, do not count and cannot be included in any class.

Publicity is somewhat of a synonym for advertising, which again means to proclaim something in the most effective and attractive way to further a purpose in the mind of the publicist to attain an ulterior object. There is, perhaps, no other business in the whole round world to which publicity is so befitting from the point of view of each class according to our division as to publicity. It is not our intention in a general article on this subject to be specific and discuss in detail methods and forms of proclaiming the wants and offerings of either class in any special line, but to confine ourselves the rather to underlying principles which should warrant the expenditure of every dollar, the energy of every moment of time devoted, and the draft upon brain power for every idea evolved and applied to the publicity department of telephony.

The basic principles of publicity in this field are as few in number as the classes which they concern, and as simple as they are limited in number. The sonorous blasts from the trumpet of the telephone man, in whatever class we may find him, announce three things always, no more, no less, and invariably in the same order, provided the trumpeter is fairly accomplished in the manipulation of his instrument, viz.: First, who and where he is; second, what he has for sale, and third, what he wants for it.

Beginning with the first division in our classification, the manufacturer, the essential truth of the first of these three principles is inherent in the condition of things without exception. With capital assembled, machinery installed, and plant ready for operation, the manager is bound to announce the fact to prospective customers. The simplest form is a personal call, when the first principle is applied as he introduces himself with the statement, "I am A. B., from the 'new telephone center,' manufacturer of telephones." Knowing the genial and hospitable nature of all telephone manufacturers it is refreshing to imagine what follows, but it is a detail without the jurisdiction of this article.

While announcement in person may be very effective, still it is limited and wholly incompetent to cover the field of operations and not at all commensurate with this day and age. Capital is diligent, impatient at idleness and pushes the manufacturer to get acquainted so that its silent energies may become active and earning. Probably the quickest, broadest and most complete introduction and announcement is through the medium of the trade journals devoted to the special industry in which the manufacturer has embarked. Their circulation and clientele are among those who are directly interested in the use of the apparatus put upon the market by the producer. The pages of the class paper are beyond question studied fully as much for the advertisements as for the reading matter, and especially is this true in telephony. The business of the Independent telephone manufacturer is of so recent beginning, the army of buyers has been so lately recruited and additions are so rapid, that the formality of making the one known to the other must be repeated again and again. The local exchange owner studies the trade journal advertisements as his directory of firms with whom he is to consult upon the all important topics of kind, quantity, quality of and price for his present and future supplies. It is his handiest and latest revised directory of manufacturers, and space therein should be occupied by the producer and jobber upon the theory that effort to make known to each other interested parties is confined to them almost exclusively, and for the further reason that it presents the opportunity for the formality of introduction being more comprehensive and the bow of recognition more sweeping than is offered in any other single medium. How large any advertisement, the style, etc., are matters of personal taste and limited by the treasury department, but the first of our principles should be rigidly and steadfastly adhered to and some space kept regularly filled in all issues of the trade journal.

Other forms of announcement to the trade, such as general magazine advertising, state gazetteers, city and business directories, may be passed with the comment that the shot are too badly scattered and after all it is the direct and center fire which brings best results. Card directory schemes, novelty and specialty advertisements are flitting and ephemeral in effect, like the brilliant hued butterfly which delights the eye for the moment, but is effaced from vision and lost to memory the next.

There is much food for reflection in the idea that advertising in the class papers is an announcement to the local buyers who are already in the business, and that there may be an advance step made to catch the eyes of those contemplating building a local village exchange, or of the group of farmers excited over the idea of a neighborhood telephone company, none of whom likely have ever seen or heard of the trade journal. Reference is had to the county seat and weekly newspaper. Here is an untried field where experience can furnish no rule as to when, where or how to plant seed, and no statistics to indicate an average as to crop. Yet the spirit of boldness and shrewdness which has dominated from the start the Independent telephone business is prompting a venture by several manufacturers into this realm of great possibilities or none at all, and within six months there will be the test of experiment and rule of experience to guide further investigation and expenditure.

The discussion of the medium of publicity of the first principle has carried with it argument of the second, because of their close and dependent relations. At the same time the manufacturer is announcing who and where he is, he is telling what business he is in and what goods he is making and has for sale. Here we enter the field of what is commonly embraced in the term advertising, something without horizon, bottomless, enticing, promising so much, yet guaranteeing nothing, fickle, luxurious, expensive, and yet absolutely necessary. How necessary is determined at a conference between conservatism, the exchequer, push, the advance idea and good common sense, a meeting which old fogeyism and the back number have no invitation to attend. The form of advertisement, its make up, goods to be represented, features to be most prominent, in fact, the whole thing should be practically dominated if not prepared by the active and controlling force in the manufacturing firm, under whatever official title it may be assumed, whether president, general manager or superintendent. No one knows better than the head of the house what special line is to be pushed, the reasons why certain of his goods are better than those of other houses and certainly, therefore, there should be no one more competent to indicate these things to prospective buyers. It may be the cause of many a headache, many a cobweb have to be brushed off the mental vision, the countenance become "sicklied o'er with the pale cast of thought," and the attempt seem crude and ineffective, but it is a safe proposition that the advertisement gotten up by the manufacturer himself or under his immediate supervision will attract attention to the things he has most at heart and offer special reasons to buyers for looking over his goods before purchasing elsewhere. Here, as in the case of the first principle, the

trade journal space utilized is primarily important, and for like reasons, but there is an assistant of equal value which probably in all cases should be used at the outset and at more or less frequent intervals as the exigencies of business seem to demand and warrant, viz.: The catalogue and descriptive circular, the foundation for its use being the mailing list of local companies and buyers, which no well managed house should be without, and something which is to be kept corrected right up to date and guarded with jealous care.

In regard to price for what he has to sell, the manufacturer usually and wisely reserves such information for direct and special negotiation with the purchaser. Varying conditions, such as quantity to be purchased, cost of installation, unequal freight rates, cash or time payments, all conspire to preclude the advisability or even possibility of naming a price in a general advertisement which shall govern all or at least many purchases in this particular field. The expenditure under the head of publicity founded on this third principle, should be devoted to the securing of advance information from the whole field of sales as to the new companies formed, franchises granted, extension of lines, agitation as to putting in exchanges, in fact, the whole category of cases where sales may be made. From this standpoint the trade journal is usually ineffective and without particular value. Ordinarily it is published monthly and the information is, therefore, too old and past its day of usefulness, and the same thing is true even of the weekly edition, because the manufacturer has better sources of information at his command. The daily and weekly newspaper in every city, town and hamlet is "nosing for news," and publishing items and advance information as to what is going on in the local field, and all this matter is collected, sifted, condensed and given daily to the manufacturer by well equipped, experienced, expert news agencies and bureaus in a fresher, more extensive and more reliable form than the trade journal can possibly afford to spend money enough to equal the service. How to use such a service is not to be dismissed with a passing thought, for what kind of letter soliciting an order is to be used, nature of descriptive matter sent, prices quoted, how to follow up delinquent correspondents, all require the best thought of the manager. If one method of correspondence does not bring proper portion of replies, or a descriptive circular does not "pan," the publicity department must be quick to note the need of change and to be ready with the improvement. The problem is general in that every manufacturer has it to work out and individual because the correct answer is different in each case. The only general rules to be strictly adhered to are "Try, try again," and "Everlastingly at it brings success."

In the case of the local exchange owner, he has little use for publicity along the line of the first principle. Simple announcement in the local paper that "I. A. B. will put in an exchange at C," is sufficient.

In giving publicity to what he has for sale, the local exchange owner has a task requiring tact and best of judgment. His wares consist of the rent of telephones to subscribers, high degree of maintenance of the local exchange, courteous treatment of customers, and anticipation and fulfillment of their reasonable requests. As the price for his wares is a fixed one, there is nothing to concern publicity except what he has to offer. The basic idea of the local owner in keeping his exchange before the public is reciprocity, for if he can at the outset convince the citizens that his plant is the best in his judgment money will buy, that his service cannot be excelled, that he is for and with the town in all matters which may advance its interests, that if there is anything in the telephone line the community desires which he can possibly afford all the people need to do is ask for it, and then keep the public constantly jogged in memory of such things, he will have as a subscriber everyone in the city who can afford a telephone, and the good will of those who cannot. With this end in view the local paper should receive a standing advertisement on a cash basis. There should never an issue appear without an item of news about the local telephone company which can all be arranged on a satisfactory basis. If the home paper fifty-two times in a year speaks kindly, in a friendly way, and points with pride to the home telephone exchange, the community is going to follow suit and support it with the heartiest patronage it can possibly afford. Continued pounding away along the lines of splendid equipment, best possible service, extension of plant if opportunity offers, and cheap rates must necessarily bring the largest returns possible for time and money expended. One of the best advertisements a local telephone company can keep before the public is that of a low rate figured out per day. The sum is so small that readers wonder why they have not subscribed for a telephone long ago.

Coming now to the third division in our classification, the user, there is much at frequent times he would willingly give the greatest publicity, but such cases are not of the kind under discussion. The user is the community which by franchise, individual subscription and good will gives life and sustenance to the local exchange, the mouthpiece and representative being the home newspaper, which from the standpoint of publicity may be treated as the user. Citizens in every city or town, large or small, have a right to expect that the home organ shall circulate to the best of its ability information about and advantages of their community along every possible avenue of growth and improvement. The telephone is coming into such common use, radiating from the city to the town, then the village, out to the hamlet, and into the farmer neighborhood, that no place pretentious enough for a newspaper is too unpretentious to agitate the telephone question. Could the public generally know the marvelous development of telephony and become aware of statistics showing into what small settlements it is pushing its way, the interest would be something unprecedented. The newspaper owes it to its patrons to keep them well informed about so rapidly growing and important a municipal interest, and above all does it serve them best by publishing the fact of the existence of a locality without a telephone exchange, or suggesting how or where the present plant may be extended. Items like these through some of the many mediums of gathering information come to the desk of the manufacturer or jobber and, behold, an inquiry or a representative from not one but several firms appears to arrange for the installation of a plant, exchange new for old apparatus or build into new fields. The price the user asks is negotiated in a franchise and publicity from the point of view of the user should be devoted to attracting and fixing attention to the place on the map where he is at, who and where he is, what he wants, how he can increase what he already has, what he has for sale. All this the newsaper stands for and should shoulder the responsibility for.

METHODS OF PRESERVING POLES.

In setting telegraph and telephone poles the earth should be removed a few inches from the poles and at a depth of two or three inches, and this hole should then be filled with tar oil, so that the pole is tarred just above and below the gound. After this is done the earth should be placed back. In some localities the Bell Telephone and Western Union companies, using large, round poles, dig narrow channels from two to three feet deep around the poles and fill the channels with rock salt for surface preservation.

MEASURING STORMS.

An Italian physicist, Dr. Tommasina, has recently laid before the French academy some results attained in the study of distant storms by means of an electric wave apparatus. The instrument used was of the greatest simplicity, consisting of some carbon granules sealed up in a glass tube, with platinum electrodes, and connected with a cell of dry battery and a telephone to a short length of insulated wire exposed to the outer air. With such an apparatus the electrical disturbances accompanying a storm as much as 100 miles away became distinctly audible as crackling and roaring noises in the telephone.

DIGEST OF TELEPHONE AND KINDRED PATENTS.

CONDUCTED BY EDWARD E. CLEMENT.

FEBRUARY 19.

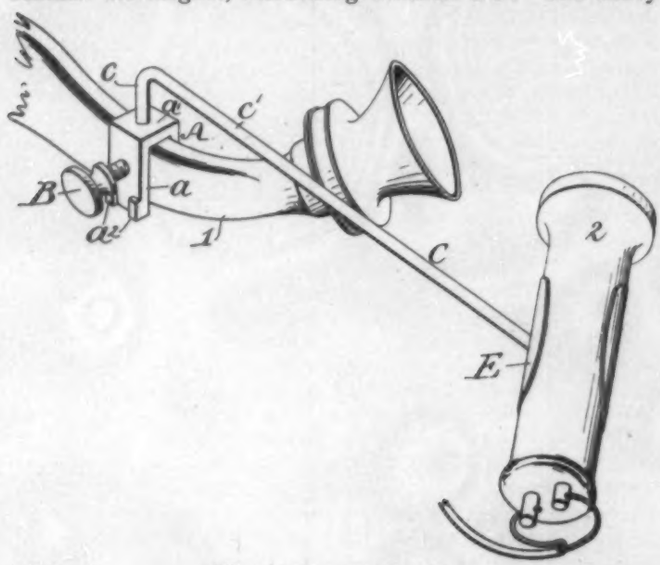
668,472—H. M. York. Holder for Telephone Receivers.

This is a holder with a clamp A adapted for attachment to a transmitter arm and a pivotally supported arm or bracket C to carry the receiver.

668,554—A. M. Bullard and L. A. Falk. Electrical Relay and Circuit.

This invention consists of a single relay capable of responding to either intermittent or continuous electric currents traversing a main circuit with which it is connected, and thereby of selectively controlling either or both of two independent local circuits and signals or other apparatus therein.

As shown in the figure, the relay R has two windings, r and s, in series through connecting wires 7-8. An intermediate pole on the magnet core serves as fulcrum for a long, heavy armature A, normally tilted down at one end to separate its contacts c-c'. A lighter armature a is pivoted beneath the magnet, controlling contacts d-d'. The heavy



668,472—RECEIVER HOLDER.

armature A is responsive only to continued energization of the magnet by coil s while the light armature a responds when brief current impulses pass, controlling a circuit M, containing relay R', which acts to shunt coil r through wires 14-15.

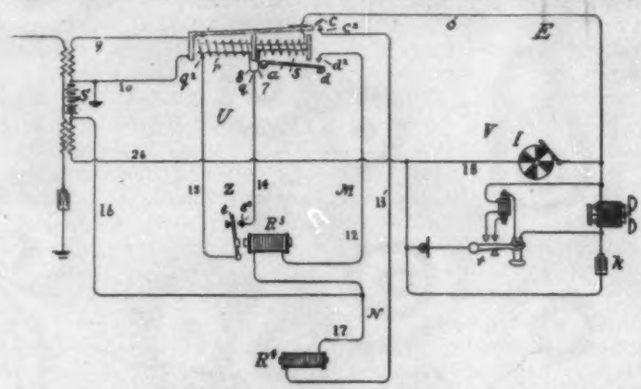
The principal use of this relay is stated to be in automatic exchanges, where heretofore two independent relays have been employed to close separate circuits containing respectively a selective magnet and a connecting magnet. At the subscribers' station V a circuit interrupter I is provided, by which a certain number of intermittent short impulses may be produced in the line 6-26, after which, by the rising of the hook switch + current may continuously flow from battery S. The intermittent impulses cause armature a of relay R to vibrate, affecting relay R', and thereby closing shunt 14-15 at each impulse. Steady current through both coils r and s will keep armature A in the position shown, because of the already short magnetic circuit through the head against which it rests, which is polarized by coil r, and the momentary shunting of this coil does not suffice to tilt the armature because of its inertia. Contacts d-d' only, therefore, are closed at each short impulse; but when the current flow becomes continuous armature a remains attracted, relay R' holds the shunt 14-15 closed, and armature A is pulled over by attraction of the right hand pole, magnetized by coil s, thus closing contacts c-c', and affecting relay R'.

In its mechanical construction the relay R is simple and ingenious, the upper armature A turning on an edge formed on the middle pole, and the contacts c'-d' being bolted to the core end.

FEBRUARY 26.

668,653—W. O. Meissner. Telephone Signaling Device.

This is a signal device actuated by the switch hook of a telephone set to send intermittent impulses to line. The circuits are of the usual arrangement, with primary circuit closed through battery F when the hook is up, and secondary with receiver C', to line B'B'. On the switch hook a series of

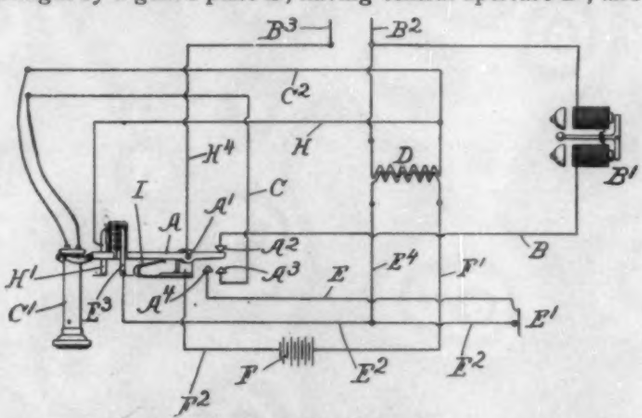


668,554—RELAY AND CIRCUIT.

insulated contacts are supported, moving under a spring E when the hook moves. These are included in a branch of the primary circuit in parallel with transmitter E, the makes and breaks thus produced in the primary of coil D causing secondary impulses to be thrown on the line to ring the bell or actuate the signal at another station.

668,702—D. H. Wilson. Telephone Transmitter.

This is a granular transmitter having cap B, shell A, diaphragm E, and an adjustable carbon holder or rear electrode, C. The latter is covered on the side next the diaphragm by a guard plate D, having central aperture D', and



668,653—SIGNALING DEVICE.

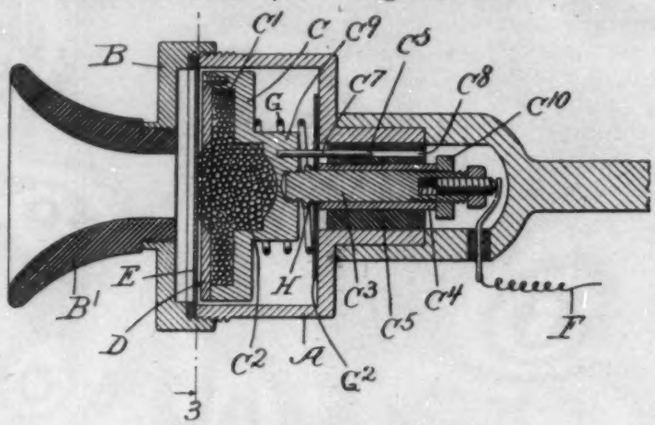
is held back against the pressure of a coiled spring G by a stem C', having adjusting nut C''. Rotation is prevented by steady pin C', and insulation is preserved by washer G' and bushing C'. One side of the circuit is through the arm to shell A, cap B and diaphragm; and the other through a rear contact resting on a spring, to wire F.

MARCH 5.

669,072—P. C. Burns. Telephone Apparatus.

This is a party line device, using the induction coil at each station for a relay to close the local ringer circuit. As shown

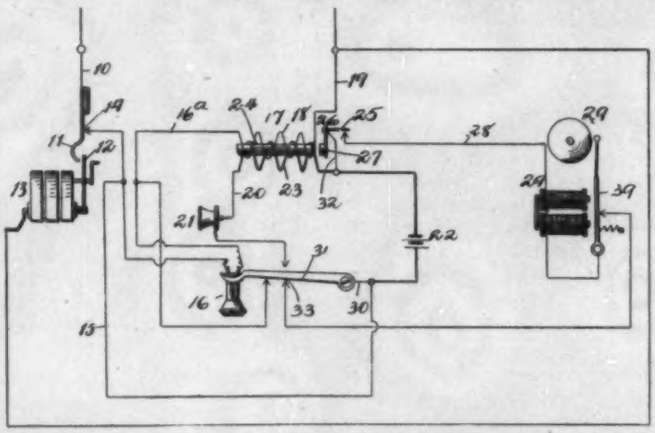
in the figure, the secondary 18 of the induction coil is permanently connected to line, the receiver being normally shunted through wire 15 by the switchhook. The generator is normally disconnected, and when used all other apparatus is cut out by spring contact 14. Local battery 22 and ringer 29 are in a circuit controlled by an armature 27 of induction coil 17. Calling current on the line energizes the core of the induction coil, attracts armature 27, and rings the bell.



668,702—TELEPHONE TRANSMITTER.

669,094—W. O. Meissner. Telephone Apparatus.

This is a spring jack having supplemental generator springs so arranged that when the plug is pushed far into the jack the line springs and generator springs are brought together. Normal contact with the tip of the plug is made by

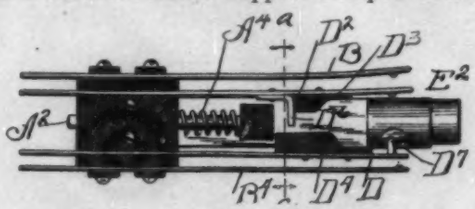


669,072—TELEPHONE APPARATUS.

notched metal piece D⁴ on line spring D³; and contact with sleeve of plug by pin D⁷ on spring D, extending through aperture in sleeve E². Spring plunger A⁴ restores plug to normal position, the contacts being broken when the plug is pushed in to call.

669,114—J. J. Hartl. Support for Telephone Receivers.

This is another receiver support clamped to transmitter



669,094—TELEPHONE APPARATUS.

arm and holding the receiver in proper position at the ear while leaving the hands free. The invention lies in the joints and the tilting carrier A¹.

669,366—C. Malthauer. Telephone System.

This is an arrangement of trunk lines and trunk signals between exchanges whereby supervisory signals at both exchanges are controlled by the called subscriber; and also where it is desired to select the trunk from the calling end and use it as an order circuit, the proper selective signals may be automatically given.

In the diagram 1 and 2 are separate exchanges with subscribers' stations X and Y, and trunk line M. Where a separate order circuit is employed the operation is as follows: X calls by taking down his receiver. Current from central battery T¹ at exchange 1 flows to line and actuates signal s. Answering plug Q² is inserted, cutting out signal s, and number

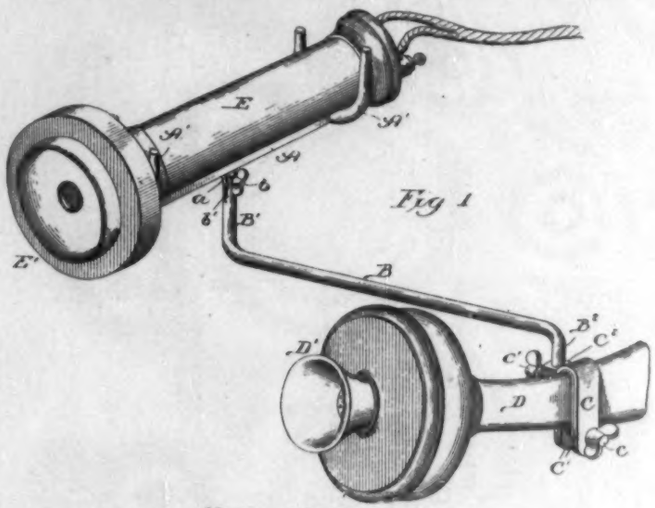
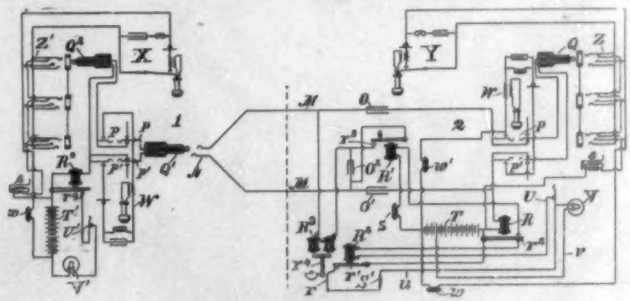


Fig 1

669,114—RECEIVER SUPPORT.

wanted ascertained. The number is repeated to operator at exchange 2, who designates the trunk, when plug Q¹ is inserted in jack W and plug Q in wanted jack Z. Supervisory lamp V¹ at exchange 1 remains dark because relay R² receives current from battery T to line and station X. Lamp V at exchange 2 lights, however, spring switch U, in seat of plug Q, being closed when that plug is raised. The circuit is: Battery T, armature r², relay R², switch U, lamp V, wire v to battery. When subscriber Y answers current flows from battery T through relay R and key P¹ to line and station Y, back to central and through impedance coil to battery. Relay R then breaks the lamp circuit of V at r², and puts battery through relay R¹, which in turn closes a shunt around condenser O², which permits current from battery T¹ at ex-



669,366—TELEPHONE SYSTEM.

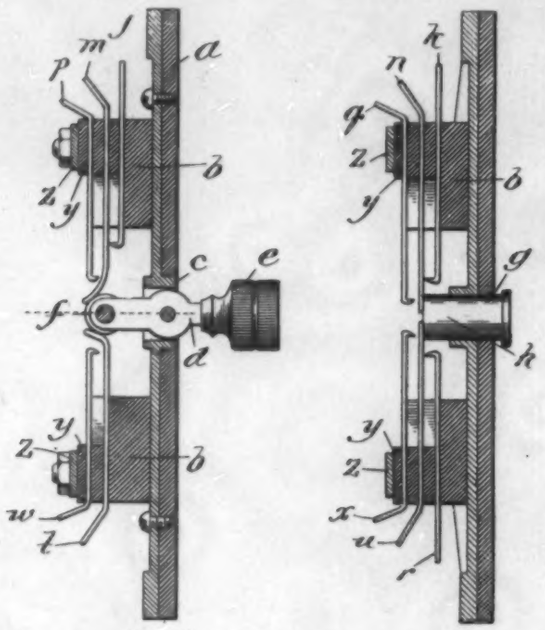
change 1 to flow over the trunk wires M, in parallel with the line X, thereby giving station Y control of signal V¹ as well as V. X may now hang up without affecting the signals; but when Y hangs up both lamps V and V¹ light at the two exchanges, for clearing out.

If no separate order circuit is employed operator at exchange 1 plugs in on the trunk with plug Q¹ and rings as she would a subscriber. This actuates bell R², whose armature rod r⁴ pushes spring r under hook on armature r³, closing circuit u to lamp V, lighting the latter as well as ringing the bell. When the plug Q is lifted from its seat relay R² gets current through spring U and lifts its armature r³, but the lamp remains lighted until Y answers, the rest of the operation being as before stated.

An order circuit with common battery is described, having the operator's receiver included between the two halves of a divided secondary and the transmitter in series with the primary. Another arrangement shows three windings on induction coil. These arrangements are to balance the lines.

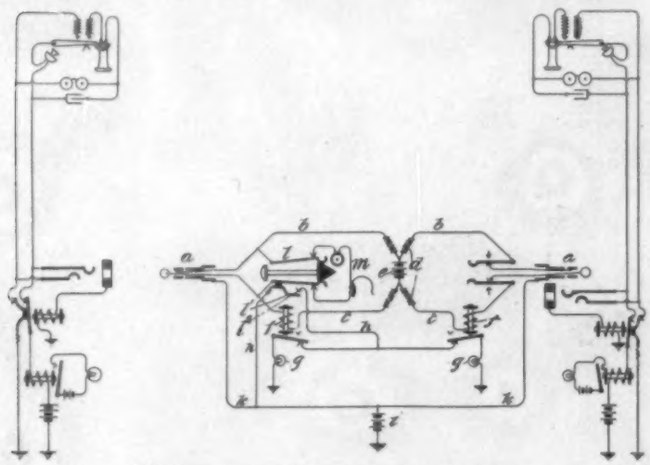
669,471.—E. E. Yaxley and C. C. Cadden. Telephone Key.

This is a listening in and ringing key for telephone switchboards. These figures are two sectional views on parallel lines, one through the listening and "ringing-up" key e, and



669,471—TELEPHONE KEY.

the other through the "ringing-back" key g. The former is a lever pivoted on a metal frame c, having a rubber face a, the lever provided with a roller f to move over the spring faces. M-j are two of the four similar cord terminal springs under lever e, the other pair not being shown; p is one of a corresponding pair of generator springs; t is also one of a



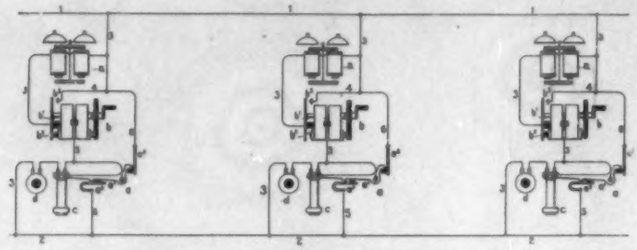
669,501—SUPERVISORY SIGNAL APPARATUS.

pair of cord terminal springs, w one of a pair of operator's springs. K-n and r-u are cord terminal springs, and q-x are generator springs. When lever e is thrown over to ring up roller f passes up on springs m, forcing them away from springs j and onto generator springs p. When pressure is taken off the lever it instantly returns to its central position. When thrown in the other direction to listen in, springs t are pressed down on contacts w, and the lever remains locked, as the roller f passes over the abrupt shoulder on springs t and is held thereby until manually restored. Ordinarily the operation of lever e will be sufficient in use, but if at any time it becomes necessary to "ring back" the key g serves to bring the springs n-u, which are connected to the answering plug onto the generator terminals q-x, at the same time separating them from the calling plug springs k-r.

MARCH 12.

669,501.—O. A. Bell. Supervisory Signal Apparatus for Telephone Switchboard.

This is a "relay switchboard," having supervisory signals g-g, controlled by relays f-f in the two halves of the divided cord b-cxb-c, the relays being energized while current is flowing through the subscribers' lines from battery



669,544—PARTY LINE APPARATUS.

e, as usual. When the current flow ceases the lamp circuits are closed from battery i, and while the apparatus is not in use the lamps would thus be lighted, giving confusing signals. To prevent this, in the present case a pair of contacts l' l', closed by the listening key l, are included in the local supervisory circuit, the key l being left normally down to connect the operator's head set m and disconnect the signals g-g.

669,544.—F. R. McBerty. Apparatus for Party Telephone Lines.

This is a party line scheme intended, the inventor says, to "avoid the loss or obstruction occasioned by some appliances of current designed to operate other appliances simultaneously connected with the line at the same station," etc.

A bridge is provided at each station, with a telephone set, a generator and a high wound ringer, the generator and ringer being in series relation. A shunt through b' b' is closed normally about the generator; a shunt b' b' is closed about the ringer when the generator is in use, and a shunt 3-5 is closed around the telephone as long as the hook is down. When the hook e rises, both generator and ringer are shunted through 3-6-c'-e-c-d-3.

669,545.—F. R. McBerty. Apparatus and Circuit for Telephone Switchboard.

This is a scheme of circuits designed to maintain the static balance of lines connected through repeating coils, and to avoid cross-talk in the cables of the switchboard.

Heretofore, where repeating coils with a ground in the

669,545—SWITCHBOARD APPARATUS.

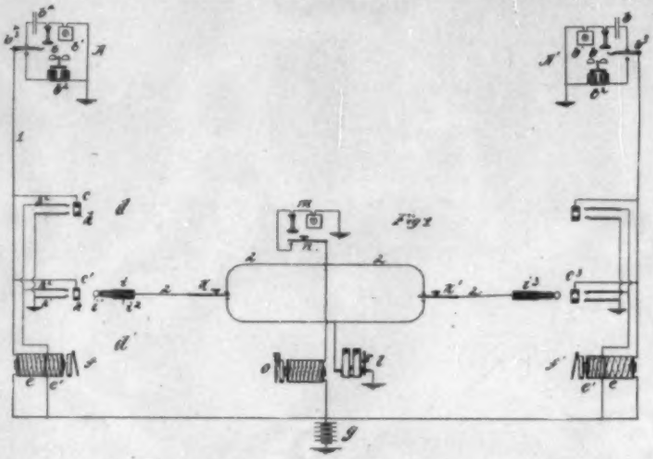
middle have been employed, with an open ended conductor run as a mate wire to a grounded line wire through the switchboard cable, one winding of the repeating coil has been short circuited, and efficiency in transmission could only be maintained by separating the windings of the repeating coil relating to one side of each line from those relating to the other, and placing them on separate cores. This, however, has disturbed the balance, and has caused cross-talk.

By the present invention the grounded line wire 3 has an open ended mate wire 4, and the coil has its two pairs of windings on the same core, put on after the fashion set forth in patent No. 382,856, to John A. Barrett, May 15, 1888; a grounded bridge between these two serially connected pairs

of windings containing the battery. Perfect balance is thus supposed to be attained, and cross-talk eliminated.

669,707.—C. E. Scribner. Telephone Exchange System.

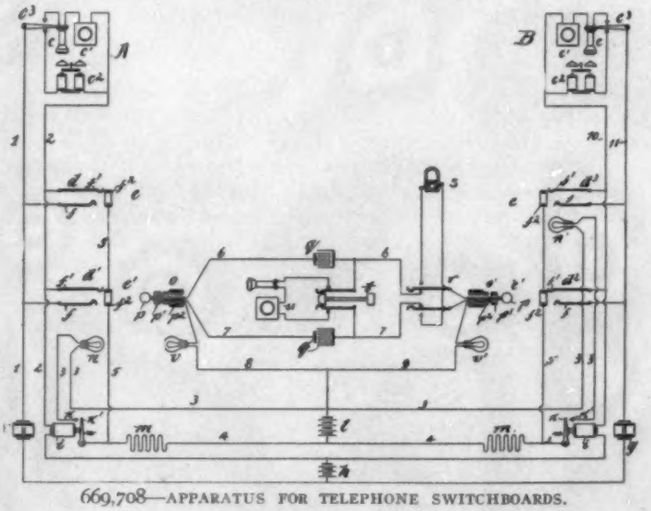
This entire system depends on a simple reversal of the principles ordinarily employed in telephone signaling. Usually the circuit is normally interrupted at the subscribers' station, and when there completed current flows to display the signal at central. In this case current from the central battery g flows all the time to the subscribers' stations A A' through annunciator magnets e, holding the signals retired. When a receiver is removed from the hook to



669,707—TELEPHONE EXCHANGE SYSTEM.

signal, the circuit is interrupted, a condenser b' being then introduced, and the signal is immediately released and displayed. The clearing-out signal o is energized by restoration of continuity of the circuits upon hanging up, and a consequent flow of current. This patent may be regarded as a freakish exhibit, for it is difficult to imagine where the invention resides, the idea of normally closed signaling circuits having been commonly in use for many years for series work, but never where there are many multiple branches, as in this case. There are nine claims allowed.

669,708.—C. E. Scribner. Apparatus for Telephone Switchboards.



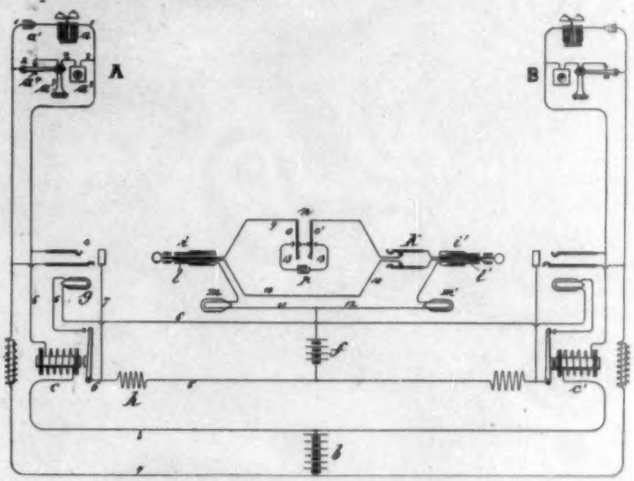
669,708—APPARATUS FOR TELEPHONE SWITCHBOARDS.

This is a common battery system, wherein a relay i in the line controls both line and supervisory signals, and the supervisory lamp also furnishes a test.

The line lamp n is in a local circuit 3-4, normally open at relay contacts k k', and supplied by battery l. When a plug o is inserted in a jack in response to a signal, the supervisory lamp o is brought into parallel with lamp n by path 8-p'-f'-5. As the flow of current is limited by resistance m, it is insufficient to illuminate both lamps in parallel, and consequently they both go out. Now, if the line is opened, as by switch hook c', current no longer flows through the line relay, and the circuit through lamp n is opened, whereby lamp v takes all the current and lights.

As a test, if any plug is inserted in a multiple jack while the line relay is excited, or while another plug circuit is connected with the line, the supervisory lamps are all brought into parallel, and all become dark.

669,709.—C. E. Scribner. Supervisory Signal for Telephone Switchboards.



669,709—SUPERVISORY SIGNAL.

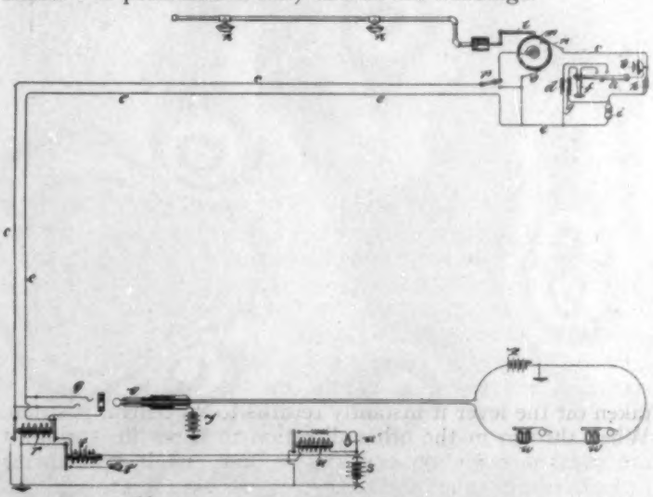
The whole invention in this case lies in a key n, whereby the cord circuit may be temporarily broken for direct currents, so that the supervisory lamps m and m', governed by relays c and c', as in the preceding case, may be operated independently. A condenser p is included in the cord when the key is operated.

669,710.—C. E. Scribner, Telephone Circuit.

This is an arrangement of local circuits at a sub-

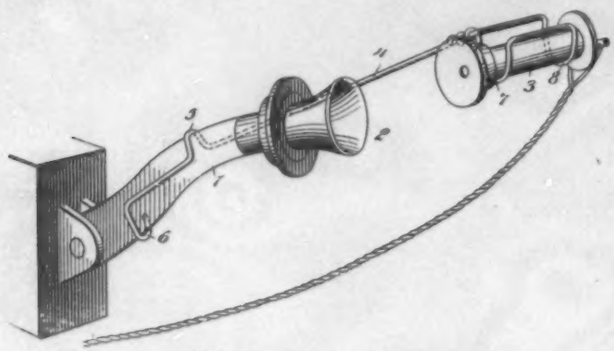
669,710—TELEPHONE CIRCUIT.

station, where a common battery is employed for all transmitters. An induction coil e has its windings e^1, e^2, e^3, e^4, so connected to line that two bridges are formed at the substation, one containing the transmitter d and windings e^1, e^3, and the other the receiver c, an accumulator (such as a condenser f or polarization cell) and all the windings.



669,792—TELEPHONE AND ALARM SYSTEM.

A steady current flows from battery a in the central office through both lines to the sub-stations thereof, finding circuit at each sub-station through the winding e^1, transmitting telephone d, and the winding e^2 of the induction coil. An increase in the resistance of the transmitting telephone d at a station tends to diminish the current through the windings e^1 and e^2 and for an instant diverts the current through the shunt 6, which charges the condenser f. The current flowing through windings e^2 and e^4 is then in proper direction to induce an electromotive force in windings e^1 and e^3, tending to still further diminish the current there. A subsequent decrease in the resistance of transmitter d permits an increased current to flow in the line circuit, at the same time permitting the discharge of condenser f. This discharge

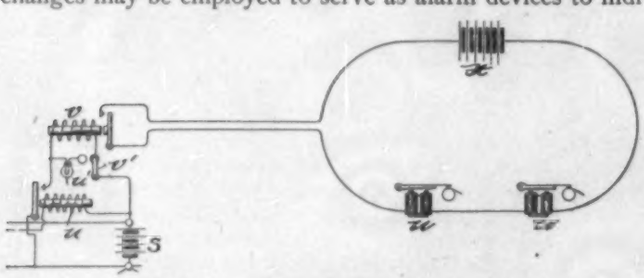


669,800—RECEIVER HOLDER.

takes place through windings e^2 and e^4, in proper direction to accentuate the increased flow through windings e^1 e^3. Sound waves striking the transmitter d therefore set up in the line circuit an undulating current, whose undulations are greatly amplified by the inductive action of the condenser f, acting through the windings e^3, e^4.

669,792.—A. S. Hibbard. Combined Telephone and Alarm System.

This invention relates to combined telephone and alarm systems, and has for one object the provision of means whereby the line signaling instruments at telephone exchanges may be employed to serve as alarm devices to indi-



669,832—TELEPHONE AND FIRE ALARM APPARATUS.

cate fires, burglars, or other alarms; and the invention has for its further object the provisions of means whereby the alarm indications may also be transmitted from the exchange to the alarm and registering office of a fire department or other alarm station. In the diagram a break wheel m is held from being turned by its train of clockwork, by a detent l, controlled by a piston device, to which air may be admitted through a pipe by thermostats, as shown. The telephone circuit is broken at spring n, when the wheel starts, and a series of makes and breaks occur which flash the lamps t^1 and u^1 at the central office, indicating a fire. The plug o may then be inserted in the jack q, whereby the circuit is prolonged to fire headquarters to give the alarm there.

669,800.—G. S. Meyer. Telephone Receiver Holder.

A wire holder, bent as shown to take over a transmitter arm and support the receiver in proper position at the ear.

669,832.—A. S. Hibbard. Combined Telephone and Fire Alarm System.

This is an improvement on Mr. Hibbard's other system, just noticed (patent No. 669,792), wherein a plug is used to connect the signaling line with fire headquarters. In the present case a relay v is employed, switched into the common return of the main battery s of the telephone exchange, alternately with the chief operator's pilot lamp u^1, so that the signals are sent in to fire headquarters automatically without the necessity of sticking a plug even.

669,875.—J. E. Cordorez. Coin Controlled Telephone.

In this device, of which parts only are shown in the figure, the usual hand generator is first operated to send sig-

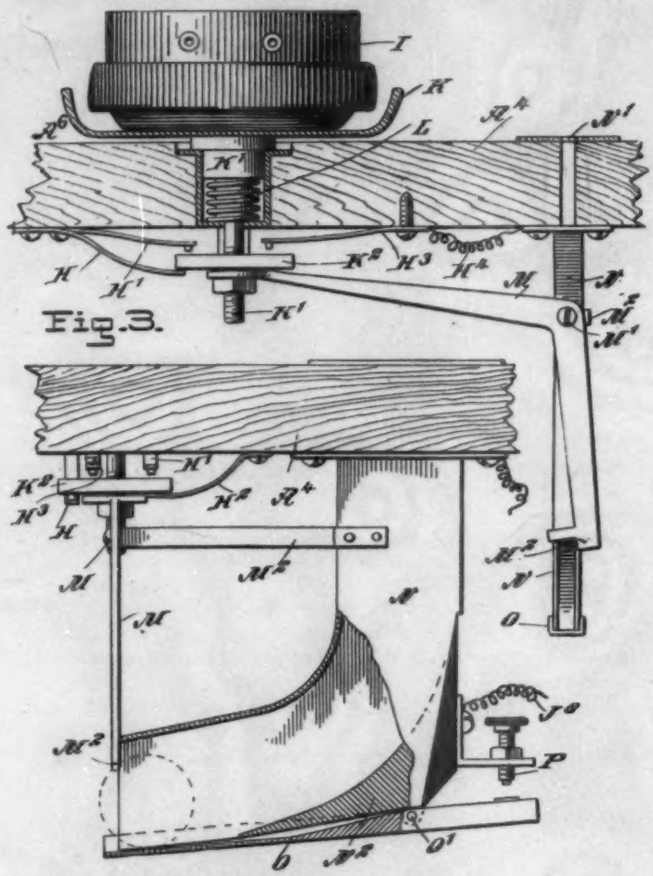
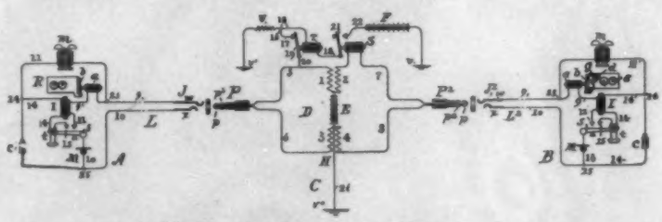


Fig. 3.

669,875—COIN CONTROLLED TELEPHONE.

naling current to central. A coin is then deposited in the chute N^1, which rolls down on the pivoted support o and lodges there, held by the lug M^3 on a lever M, which is movable by a switch button K^1, on which the receiver I normally rests. If the coin is of too small a size it will pass at once beneath lug M^3, but if of proper size and weight it will be held and will tilt support o to close on the contact P, thus completing the talking circuit. The necessary switching out of generator and ringer is accomplished by springs H, H^1, H^2, worked through button K^1 by receiver I.



669,900—SERVICE METER AND CIRCUIT.

669,900.—D. S. Hulfish. Telephone Service Meter and Circuit.

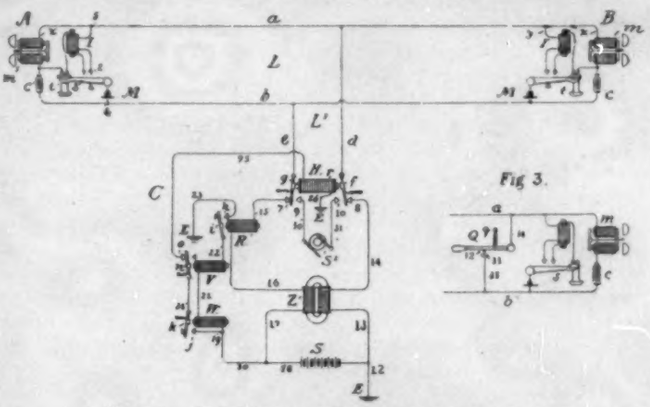
This is a register device at the subscribers' station, adapted to be worked by a heavy current only, so that the ordinary current of central battery systems does not affect it. When the wanted subscriber answers his act of answering

momentarily connects a heavy battery to the calling line and works the register, whose magnet then holds up its armature until the plugs are finally removed.

In the diagram E is the usual bridged battery and a is the register magnet at the sub-station A. When A calls and the operator gets the required subscriber (B), his answer completes the circuit through his relay S, which connects battery F from ground through relay T, and by wires 5-9-23 to the magnet a at station A, and thence by circuit 12-S-10-6-3-26 to ground. The momentary rush of current energizes magnet a, which then holds up its armature until current from battery E is cut off. Relay T cuts off the heavy current after a moment's flow.

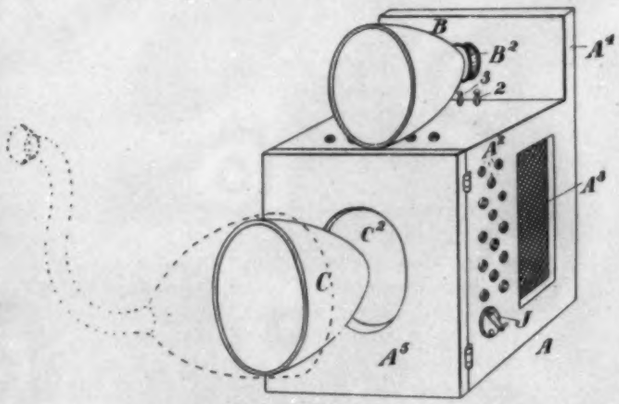
669,901.—M. C. Rorty, System of Central Current Supply for Private Line Telephone Circuits.

This is a very ingenious system, whereby both ringing and talking current may be supplied to private line circuits from a central station. In the figure A and B are two sta-



669,901—SYSTEM OF CENTRAL CURRENT SUPPLY.

tions connected by a private line a-b. These stations may be located in a private residence or business house, and have no exchange connections for talking. At each station, however, the equipment is the same as for a central energy exchange line, the condenser c at each station preventing the flow of battery current when the hook s is down. When the hook is up the transmitter M and the secondary of the coil I are bridged, and the receiver and primary are connected in circuit with the condenser. This is in accordance with recognized practice for substations. In order to supply the



669,944—TELEPHONE.

line a-b with current, a pair of wires e-d are run from the central office C, where they are normally connected through the armatures f-g to circuit 14-15-16, and through the impedance coil Z to the battery S. With the telephones off the hooks there would thus be a steady flow of current from the battery. This flow causes the energization of the relay R, which pulls up its armature i, closing circuit 20-21-23 through the relays V, W, the former of which is a fast relay and the latter is very sluggish.

Now, if A desires to call B, he proceeds to move his hook s up and down several times. When the hook moves up the action referred to above follows. When it is moved down the following action takes place: The armature n retracts quickly, before the armature k leaves the point j, completing a circuit as follows: E-12-S-18-20-19-k-24-n-25-relay H-26-E. This energizes the relay H, which pulls up the armatures f and g, cutting off the battery current and connecting the ringing generator S' to the line e-d, thus ringing the bells at the two stations A and B. This may be repeated as often as desired, for the purpose of giving distinctive signals.

669,944.—A. P. Merrill and J. W. Hays. Telephone.

This is a telephone set particularly intended to amplify the sounds transmitted, a number of sets being shown distributed about a theater, a transmitter on the stage picking up speech and music, and receivers at different points in the auditorium rendering the same audible where they would otherwise be lost. Both the transmitter B and the receiver C' have parabolic mouthpieces intended to concentrate the sounds on the diaphragms of the instruments. There is nothing distinctive in the structure of either transmitter or receiver, except that the latter has a large diaphragm damped by a cloth ring, and insulated from resonant effects in the wood casing by felt gaskets. The casing is provided with openings A' to prevent a dead air cushion back of the diaphragm. An ear tube and bell may be attached to the receiver mouthpiece if desired.

TELEPHONY IN GREAT BRITAIN.

The National Telephone Company, profiting by the experience of the telephone system in America, particularly in San Francisco, intends to extend its operations in Great Britain in a way that will bring the benefits of telephone communication within the reach of a much wider circle than at present. The company is prepared to fit up and maintain telephonic instruments on subscribers' premises on the party-line system. The cost of service is collected at the time by an ingenious arrangement on the penny-in-the-slot system, hence there is no account to meet monthly or quarterly, as the case may be, and all liability is confined to the following rates: Two dollars and fifty cents a month for each subscriber on a two-party line, $2 on a four-party line and $1.25 on an eight-party arrangement. Under this last head the total cost works out at $15 per annum.

Owing to the many complaints made by subscribers of the delays in getting connection with places in the country, the National Telephone Company has communicated with the postoffice in hope of remedy. The response, however, is to the effect that a minimum of 20 minutes must always elapse before any reply can be made as to when a call for a telephone district outside the metropolis will be answered. It is believed that an insufficiency of trunk lines and a lack of employes are responsible for this new and vexatious regulation, which is certainly not a hopeful augury for the coming postoffice telephone system.

GLOBE AUTOMATIC TELEPHONE COMPANY.

The inventors and others connected with the Globe company claim to have had many years of experience in automatic telephony, and therefore are thoroughly familiar with the requirements of systems of this class. No doubt their past experience is of great value, and assures success for the new company. The officers are: J. E. Norling, president; J. K. Norstrom, vice-president; P. O. Norling, secretary and treasurer; F. A. Lundquist, manager; J. J. Brownrigg, superintendent. The offices are at 59 Dearborn Street; factory, 31-45 West Randolph Street.

THE COURAGE OF A COWARD.

BY FRANK GOEWEY JONES.

Advance, retreat, advance, then retreat again. Always moving, forever fighting. What wonder that their tired limbs stumbled. Of sleep there had been little; of eating, less. Their thirsty tongues were parched by the choking dust. Their blistered feet were cruelly chafed by stiff, rough shoes, so that they bled, and burned, and bled again. Only the blessed numbness of utter weariness enabled them to move without unbearable pain.

Three days and two nights the battle had lasted. Three days of stubborn advancing; two nights of dismal retreat; a tireless enemy, with the superhuman mobility of a watchful, merciless demon, had compelled them each night to relinquish the blood-won fruits of the day. Scarcely five hundred yards of dusty veldt had been conquered. Conquered; no, but held by a precarious thread. And now again it was evening. What more hope was there for this night?

The Twelfth Regiment of Her Majesty's volunteer infantry looked very bravely proud when it marched through the streets of London, a short six months before, bound on foreign service against the South African farmers who had dared to defy the flag of St. George. Eager, impatient they were then. The war was to be only a glorious, spectacular march of triumph; a progress of the victorious over the land of the conquered. But it was not quickly over. Days grew to weeks, and weeks became months. Still the obstinate Boers refused to be beaten. The blunted minds of the khaki-clad Tommies had come to fear that defeat was for them and not for the veldt men.

Tired soldiers do not wish to be heroes. They have no ambition but rest. Nor does it make them the braver after each gain to retreat. Weariness may go manfully forward, but backward steps bring despair. The low, weird moan of the bullets that fly far over head; the angry whirr and buzzing of those nearer the earth, and the sharp spat or sickening spud of the missiles which scatter the dust at your feet, or transform in the wink of an eyelid a man into senseless clay, beget a horrible fear.

Men who would face a cavalry charge without flinching; men who in a hand-to-hand fight would grapple with grim death itself—brave men have paled and trembled at the ping of an unseen bullet over their heads.

Her Majesty's Twelfth Volunteers were like other men. To a man they were afraid. Their nerves worn threadbare by resultless danger, were no longer of use to sustain them. Were they cowards? No. They were children. Their manhood strength was gone. Like machines they had battled, and unless they were kept at the fighting they would forget their mechanical parts and would feel, and feeling, would give way to ungoverned fear. Their colonel, a wiry Indian veteran, had been with them in every peril, but even he had lost heart.

The leaden hail sings faster and louder. The bullets, like storm driven rain, spitefully spatter the grass. The battle-worn wrecks of the soldiers face a withering, merciless fire from invisible foes. Can they stand the strain again? Crouching low in the coarse, blood-stained grass, sheltering behind a hillock of earth, a bush or a stone, they are holding, their teeth pressed together, their ground. The fast falling night to their eyes is full of forebodings. No retreat yet. But what of the darkness that is coming?

One man in the line is more afraid than his comrades. A beardless boy when he left his quiet English home, he is only a baby now. A merrier lad or one better liked there was not on the transport ship. But as he lay in the rank growing grass his heart failed in its beating, from fear. A screaming shell which burst not a rod from his side and covered the ground with its fumes snapped his strained nerves and, crazed with his dread, he dropped his rifle and ran. Blindly, his blood turned to water, he fled toward the rear. He tripped on a loose stone under his feet and stumbled and fell. Before he could rise five sinewy fingers were grasping his throat. The cold steel of a pistol pressed hard on his face.

"Stop! You cowardly cur. Move one step backward and I'll kill you. Find your gun and return to your place in the line or I'll shoot you as I would a dog."

Frightened by his desertion the men on the line were trembling and wavered; but when the coward, scarcely knowing what he was doing, rejoined them, they dared not leave their posts.

Slowly his terror-struck mind grasped the extent of his disgrace. A coward! A coward! A coward! The blood which in dread had deserted his face billowed back and he burned with his shame. A coward! Disgraced and despised by his comrades. Not even entitled to the respect of his enemies; lost to the love of his friends. His fear was gone in an instant. Hot, agonized tears blistered his face. And to-morrow he would be sought for and found and shot like a cur. That was to be the end of his picnic of war. To die at the hands of his fellows; to lie in a shallow grave on the veldt, with English, not Boer bullets, piercing his heart.

The night, and with it blackest darkness, had settled over the field. Still the Mauser bullets sang their shrill chorus of death. The regiment, finding its position swept from three sides, once more retreated. In the ranks, shunned by his file mates, marched the shame burdened coward; his case in the pressing danger forgotten by his commander. They were halted at last, almost on the very spot where their last cheerless night had been spent. They lay almost dead on the ground.

The colonel consulted his staff and then called his men to "attention." Thus it was he spoke to them:

"Men, we shall never be able to go through that hell to-morrow. We must flank them or give up and retreat. They know this cursed country and we don't even know where they are. To-morrow you will lie in your trenches; but I must know what the burghers are doing. I want a man to take a field telephone and a half mile of wire and go to-night to the top of Maarten's Kopje, where he can see and report on their doings. There are some bushes on the top of the kopje and a man may live to get back if the Boers don't see him. But his chance is not one in a thousand, for if he is seen they will make him the target for five hundred rifles. It is almost sure death, men, but I want a volunteer."

Scarcely had the colonel ceased speaking when the man whom he had called coward stepped out from the ranks and, his voice trembling with yearning, he begged to be permitted to go.

Life was sweet still, even to those half-starved, pain-racked men, and no soldier offered to take the coward's place. The colonel came roughly to him, but his first look into the volunteer's face made his gruff voice gentle as he gripped the lad's hand. Those who were near him afterward said there were tears in the commander's eyes.

The forlorn hope was not to be sent out till near morning and the volunteer slept on his arms. At an hour before daylight he crept noiselessly out over the field of yesterday's battle, out past where he lay when the lyddite shell burst beside him, and into the shadow of the sparse leafless scrubs which crowned old Maarten's Kopje. He

uncoiled his wire as he went and had only sufficient to reach the top of the hill. Then he waited for daylight.

Morning broke over the mountains, and when the first rays of the sun sought out the shades of the valleys, the Boers were surprised to find no trace of their yesterday's foes. Nevertheless, they sent bullets into each crevice all over the veldt. Keen-eyed marksmen searched out with their eyes and their rifles every possible place of concealment. Not one, however, had yet thought to waste a bullet on the seemingly innocent brushwood which covered Maarten's Kopje. If any burgher had thought of the hillock at all, he would have decided that it could not shelter an army, and no single man could be crazy enough to hide there so far from his comrades. The soldier, therefore, was safe.

Carefully noting each enemy's movement, he telephoned back to the trenches everything that he saw. The Boers were beginning to grow restless under their curiosity to learn what had become of the English, whom they could not see and who returned no answer to their fire. Could it be that the hated invaders had slunk away in the night. More and more they exposed themselves with the carelessness bred by a loose discipline and imagined triumph, and from his vantage point the faithful scout reported each movement. He was not a coward now.

The Boers, unable to restrain their impatience, commenced a disorderly movement, a sort of crude reconnoisance in force which, if continued, would leave their strong positions exposed to attack. The message is telephoned in to the colonel, who plans out at once a flank and rear movement designed to secure the Boer trenches. The regiment only awaits the scout's word to begin a furious battle. The messages come.

"They are still advancing and are now about 500 yards from their first line of trenches. They are half a mile to my right and a small force is cautiously going up the valley to my left.

"Now the two divisions have again united. They are having an exciting discussion.

"Now they have started out again as before, about half of them in each party. Altogether there are a thousand at least and there are not over two hundred left in the trenches. It will soon be time to charge them on the right.

"They are turning toward me now. I think they are going to come to the top of this kopje. Now, now is the time to cut in behind them."

The regiment is at once in motion, creeping invisible out to the right of the Boers. Still the telephone messages come.

"They don't see you yet. They are still coming this way. They are certain to find me, but don't notice me yet. Yes, they do. A big fellow is aiming straight at me now."

And (after a minute's silence):

"He got me a nasty one in the shoulder then. I guess it's all over with me now.

"I caught it again, and—I—can't—see—them—very—well—any—more. I—"

No more messages came.

The Twelfth succeeded in flanking the burghers and worked between them and their trenches. The fighting began then and the Boers rushed the English like tigers; but the Queen's men would not be defeated. They captured the trenches and forced back the Boers time after time with success. At last they charged with the bayonet and sent the enemy scurrying down to the valley in full retreat.

Then every English eye was turned to old Maarten's Kopje, far out on the veldt. A detail was sent out at once to rescue the hero and bring him back to the lines.

Tenderly they bore him, his telephone beside him, on the rude stretcher they made with their guns. But he did not know of their coming. His eyes were closed as in sleep. The sergeant who led the detail told how they had found him, his body torn by a score of bullets, but sheltering to the last his telephone, at the end remembering his duty. That night by the light of the moon in the full they buried him on the veldt, and the moonbeams shone down on the face of the uncoffined dead in peaceful blessing.

"WELL-KNOWN HEADS OF WELL-KNOWN HOUSES."

A BIOGRAPHICAL SKETCH OF ARTHUR STEIN.

Mr. Arthur Stein, whose portrait is presented herewith, is secretary and treasurer of the Eureka Electric Company, Chicago, and is one of the well-known men in the independent telephone manufacturing field. He was born in the city

ARTHUR STEIN.

of Chicago, February 21, 1870, and attended the public and high schools in the city of his birth, after which he entered the Sheffield Scientific School, Yale University, graduating in the spring of 1891. In July, 1891, Mr. Stein associated himself with Stein, Hirsh & Co., the well-known Chicago starch manufacturers, and in the fall of 1898 he and Mr. I. J. Kusel organized the Eureka Electric Company, which has become one of the leading independent telephone manufacturing companies of the country. Mr. Stein comes from an old Chicago family; he is a brother-in-law of Judge Stein of the Superior Court and a nephew of Adolph Kraus, both men of prominence in Chicago legal circles. He is a member of the Standard, Lakeside and Thirteenth Clubs, and is popular both in social and business circles. His affability and cleverness have made him many friends in the telephone field, who will be glad to know he is soon to wed one of Chicago's fairest daughters. TELEPHONY offers them both its sincerest congratulations.

Telephony.

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A REQUEST.

It is the purpose of TELEPHONY to publish each month such articles as will appeal to the greatest possible number of telephone men. To this end we ask that each one interested in the success of this publication write us as to the class of matter he considers of most interest. Of course, we know opinions will differ as to what should or should not be published, but we believe that from the letters received we can form a pretty fair idea of what kind of a publication is wanted. We have mapped out a line of articles for this year which we think will meet with the approval of most of our readers, yet we feel the best results can only be obtained by getting expressions from at least some of our sixty-five hundred readers. We are interested in this publication in many ways. We want to give our readers just what they need most, and to this end we invite their kind co-operation.

TELEPHONY—FOUR MONTHS OLD.

With this issue TELEPHONY will be four months old. At this age it is an eighty-four page publication, which seems remarkable, considering the dire predictions which were made when it was started. We were told it would be impossible to publish a modern journal at a subscription price of fifty cents a year; we were told many other things, which were not conducive to our peace of mind. Notwithstanding all this, we issued the first number, and it met with instant approval, and from that time on the success of TELEPHONY has never been in doubt. In this issue we publish more telephone advertising than has ever appeared in a single number of any publication. We have thirty-seven hundred and sixty telephone subscribers, which is many more than has any similar journal. Our telephone circulation is the largest; we have better articles and better illustrations than can be found in any other telephone trade paper, and it is our intention to strengthen the publication in every way each succeeding issue. In the very near future TELEPHONY will be a hundred-page publication and have a circulation of ten thousand copies. When this point is reached we will raise the subscription price to one dollar a year. We believe it will be worth a dollar. The foregoing is not written to laud the publishers, but is a simple statement of facts to show that TELEPHONY is in the field to stay. We sincerely thank both our subscribers and advertisers for making a hundred-page telephone journal a possibility.

A DISCUSSION DEPARTMENT.

It is the purpose of this journal to open a department for the discussion of engineering problems in telephony, and to this end we ask those interested in the advancement of the art, to submit problems and comment on anything which they may think of general interest. This will be a separate department from "Questions and Answers," which is inaugurated with this number.

EIGHTEEN YEARS AGO.

To get some idea of the marvelous progress made by the telephone in late years, it is only necessary to read the following item, taken from the September, 1883, issue of Electricity:

"The rapid adoption of the telephone since its first practical application is unprecedented. It went into general use all over the world almost instantly. Nothing could better demonstrate the necessity for such an invention than this universal appreciation. New York City, of course, leads in the number by some 6,000 subscribers, Chicago being second in the list with about 3,000, while Cincinnati numbers about 2,000. Of course, these figures do not include private lines. It is estimated that telephones are now in use in the United States by nearly 200,000 subscribers. Absolutely correct figures are unattainable, as there are many little towns and small manufacturing centers using from 30 to 50 telephones of which no account has been received; but 200,000 is not at all an excessive figure. From statistics compiled by the "Compagnie International des Telephones" regarding the telephone business of the world, we learn that Paris has 2,422 subscribers; London, 1,600 subscribers; Amsterdam, 700; Stockholm, 672; Vienna, 600; Berlin, 581; Brussels, 450; Turin, 410; Copenhagen, 400; Mexico, 300; St. Petersburg, 145, and Alexandria, 118. While the annual subscription in Paris is about $126, in London $105, and in the provincial towns of France $84, the rates lower to $63 and $42 in Belgium, $28.35 and $27.30 in Italy and $25.20 in Switzerland. A calculation of the ratio of the number of subscribers to that of inhabitants of each town reveals a goodly number of small towns in America, where there is a telephone for every 20 inhabitants; in Chicago and Zurich the

proportion is about one per 200; in New York, one per 500; in Brussels, one per 800; in Paris, about one per 1,000; in Berlin, one per 2,000; in London, one per 3,000, and in St. Petersburg, only one per 4,000. The United States offers the largest field for utilizing the telephone, as a matter of course, and its development, consequently, has been greater. In this country the demand is rapidly increasing, in some cities at the rate of 20 per cent, and yet the telephone is but six years old—a mere baby."—Electricity, September, 1883.

THE ROMANCE OF THE TELEPHONE.

(Continued from page 103.)

to the Bell company—at least, until the expiration of existing patents. The last of these was the Berliner patent, finally—and, the anti-Bell people say, fraudulently—issued in 1891, in order to prolong as much as possible the Bell supremacy. Should the Berliner patent be held effective for seventeen years from 1891, the Bell company will continue to have until 1908 a great advantage over independent companies. The latter aver not only that the Berliner patent of 1891 was fraudulently held back, but that it is invalid anyhow, by reason of the expiration of Berliner's patent of 1880, which covered substantially the same principle.

The next scene in the telephone drama is pathetically farcical. Again Elisha Gray is the hero, and again Alexander Graham Bell is accused of being the villain.

Notwithstanding the settlement in the Dowd case, which was supposed to conclude the Bell-Gray controversy on December 24, 1886, Gray filed a petition for a reopening of the whole case in the United States courts. This time the charges of fraud, involving Wilber by innuendo, are spread formally on the record as follows:

That on or about the first day of March, 1876, A. G. Bell, the successful party in said interference proceedings, went to the Patent Office and by undue and unlawful means and influence procured full knowledge of the contents of and drawings attached to a certain caveat accurately describing a speaking telephone then recently (viz., on the 14th day of February, 1876) filed by petitioner . . . By the knowledge thus obtained . . . the said Bell was enabled to construct an apparatus a few days afterward by which he succeeded in transmitting articulate speech . . . and which apparatus the said Bell claimed was the apparatus described in . . . an application which he had filed in the Patent Office on the said 14th day of February, 1876.

This suit was decided against Gray. Nor have the courts of the United States, no matter who attacked Bell, failed as yet to decide in Bell's favor. That is why the consensus of expert opinion is that Bell must be regarded as the inventor of the telephone, because he first made it practical and introduced it into general use. This opinion ignores all charges of fraud and innuendoes of bribery and perjury. It is the opinion held by such eminent experts as F. W. Jones, chief engineer of the Postal Telegraph Cable Company.

There are many thousands of American citizens who conscientiously believe not only that Gray is a much abused man, but also that Dolbear, McDonough and Drawbaugh, all of whom have been parties to some of the various litigations, have each and all been cheated of their just dues, cheated by the courts and in the courts, by perjured testimony, by the admissions of treacherous counsel, by the oppression of the Bell millions, by precedents fraudulently established.

Professor Gray is now sixty-four years of age, a resident of Highland Park, near Chicago, and still an active worker in the electrical field. A patent was issued to him some months ago. He is a professor in Oberlin College, at which he studied in his youth, a raw blacksmith's apprentice. His has been a long and wonderfully interesting life. Professor Dolbear of Tufts College was bred, like Gray and Edison and Short, in the telephone school of Ohio. Dolbear was graduated from the Ohio Wesleyan College, at Delaware, in 1866, having already invented a "magneto electric telegraph." Going as professor of physics to Tufts in 1874, Professor Dolbear shortly afterward began experiments in telephony and the conversion of sound vibration into electricity. In 1876, the year of Gray's caveat and Bell's application, he actually invented a speaking telephone, but not until September. Bell's first patent had already been issued in March; his second patent had been applied for. Before Dolbear had completed the model of his speaking telephone, to be filed in the Patent Office, he "was informed," the records say, "that Professor A. Graham Bell had declared that he had secured a patent upon the same thnig."

That was the Bell-Dolbear encounter, and Professor Dolbear was unhorsed, like all the other anti-Bell champions. In 1881 Professor Dolbear secured a patent upon a new (static) system of telephony. His original rights are believed to have passed to the Bell company by purchase.

Speaking of the Bell telephone exhibited at the Centennial Exposition, Professor Dolbear says in his book on "The Telephone:"

That was the first speaking telephone that was ever constructed so far as the writer is aware, but it was not a practicable instrument.

If the original Bell telephone was the "first speaking telephone," then the Bell contention is gained. There is no doubt that it was soon made "practicable," and the courts have consistently refused to impeach the means used to reach that result. And once more there is an apparent vindication of the intelligence, energy and resourcefulness of the man who tried so hard to sell Don Cameron a one-third interest in the Bell telephone for ten thousand dollars "that Senator Cameron ordered the 'crazy inventor' to be turned away from his door."

That was in 1878; and a quarter of a century has never in the history of the world seen such marvelous developments from any one product of man's mechanical genius as have crowned what has all that time remained and is yet "the Bell telephone."

POETRY AND SCIENCE.

"We are like ships that pass each other on the ocean. To them wireless telegraphy is most useful. Who can say that the next ten years may not see thought transmitted from man to man at a distance in the same mysterious manner and without sound waves or light waves or electric waves? It is possible that our brains are centers of energy, which, like an electric generator, send out currents through some unknown medium."

In this fashion Arthur B. Abbott of the Chicago Telephone Company, a practical man of science, spoke to the women of the Klio Association.

In that day shall a man out of uttermost India whisper,
And in England his friends shall hear;
And a maiden in English sunshine have sight of her lover,
And he behold her from Cathay.

So Stephen Phillips, one of the younger English poets, voices the same thought in his poem on the passing of the century.

No more striking illustration of the intimate relation which exists between poetry and science could be found. Both the poet and the man of science must be men of imagination. Both must be dreamers. The poet puts his imaginings into singing words. The scientist builds a fabric of wires and electric batteries and delicate mechanisms. Both must obey the eternal laws of rhythm and harmony if their work is to be well done. The poet is the pioneer. There are no bounds to the flights of his nimble fancy. The man of science follows by a more laborious path. It is his work to give visible form and substance to the poet's dream. Both are really poets. The difference between them lies in the vehicles of their expression.

ILLUSTRATED COURSE IN TELEPHONY.

CONDUCTED BY W. A. TAYLOR.

TELEPHONE TROUBLES AND THEIR REMEDIES

One great necessity in line work is to have the wires strung straight in the lead. If this is not done the work of hunting trouble becomes very difficult. In a crooked lead the wires frequently appear crossed when they are not, and on the other hand crossed lines are frequently passed because the lineman takes it for granted that it is simply a "saw buck" in the lines. It is also necessary to have the lines straight so that every pin may be available for wires.

In order to understand how to keep a line straight a lineman must know how to make his cuts correctly. On all aerial leads of open wires the pins should be numbered as the words on a line and the lines on a page. That is, standing with the back toward the central office and facing the pole, the first pin is on the left hand end of the top arm; the numbering then proceeds from left to right. Each line should have the same pin number throughout its entire length. The longest line should be on the top arm, on the middle pin or next to the pole, while the shorter ones should grade outward from the pole and downward so the shortest will be on the end pins of the bottom arm.

Suppose there is a line to string from pin twenty (the second arm) Fig. 13, on pole A. There is only one span in which the wire can be strung straight ahead. At a, on pole

Fig 13

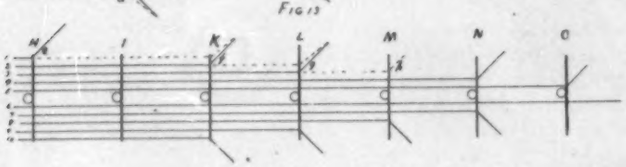



Fig 14

B, another line (19) breaks off; this drop is cut from 19 and spliced to 20, then the wire is strung on 19 till pole D is reached, when 18 drops off. The drop is then cut from 18 to 19 and then 18 is continued to pole F, where line 17 drops off. The drop of line 17 is then spliced to 18 and 17 is extended to pole G. The drop from line 16 is "cut" on to 17 and we go ahead with 16, but at pole H there is no pin vacant and we must put on a new cross-arm. On this same pole H on the top arm, Fig. 14, line 1 drops off. We cut the drop from line 1 on to line 16 and proceed with 1 to pole K, where the drop of line 2 is cut off and spliced to 1; in like manner on pole L the drop from 3 is removed to 2 and the line is strung to pole M, where it is to drop off. In this way of stringing wires no cross-arms need be added till every pin is utilized. The above is the method used for stringing a single wire. Of course where there are metallic circuits there will be two cuts for every one. Where there are metallic circuits and grounded circuits on the same pole the metallic should be placed on the top arms. Party lines should also be put as high as possible in the lead, but under the metallic circuits unless they are also metallic. It is exceedingly hard to keep a lead in good shape where there are party lines, metallic lines and grounded lines. This would not show up so badly on a straight away lead, but on a branch the corner looks bad and the pin number is lost.

Of course the numbers of all the lines are changed in making the cuts and the subscribers on those lines come in on the wrong switchboard drop. This is, of course, remedied in the office at the distributing board.

Never even for a short time string a wire crooked in

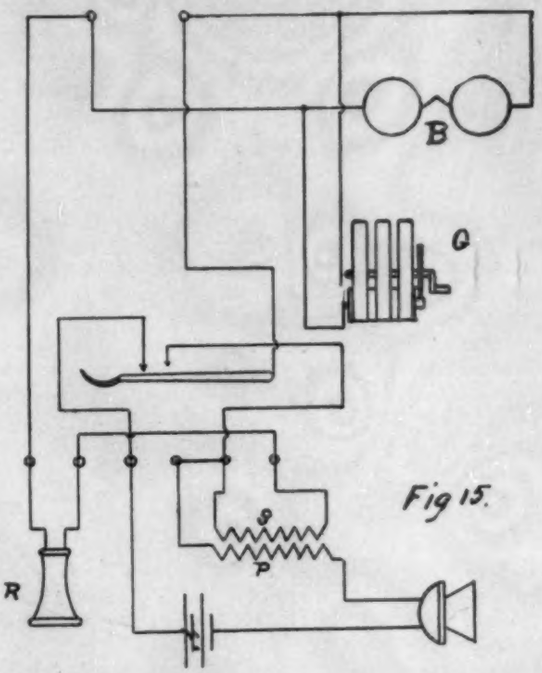


Fig 15.

the lead, for it entails a great deal more work in the end in straightening out the work than it would have taken in the first place to have done the work correctly.

It is surprising what a difference there is in the appearances of good and bad leads. A great deal of opposition to overhead wires comes from the fact that they are put up in

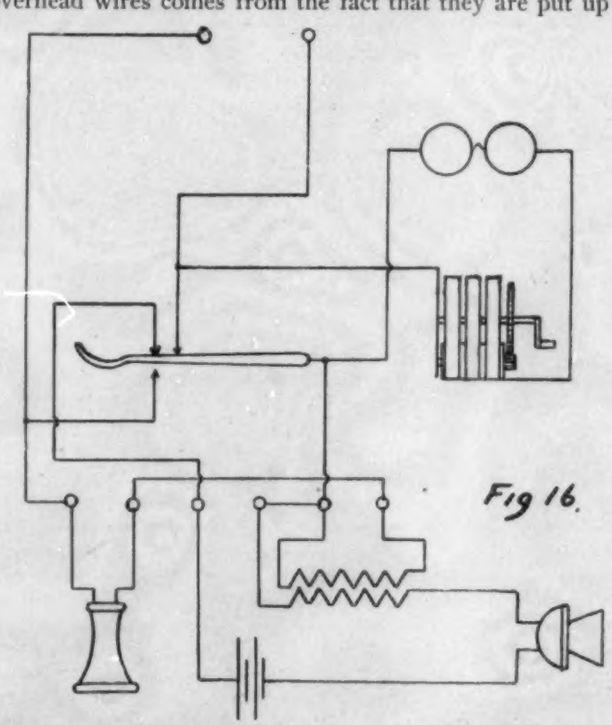


Fig 16.

a slovenly manner. If the lines are put up properly and the poles kept nicely painted, the life of the lead will be prolonged and the work is sightly.

An additional word may be said with regard to climbing

exchange poles. Spurs should not be used on the poles under any considerations, but all of them should be stepped to a point seven or eight feet from the ground. Then a small ladder may be used to reach the lower steps.

Instrument trouble.—As a general rule, if instruments are inspected regularly, once every three or four months, comparatively little trouble will be found. In each inspection each instrument should be thoroughly overhauled, cleaned and dusted, all contacts put in good shape, the battery solution renewed, and if necessary the zinc and carbon elements changed. First will be considered a class of instruments with local battery and local energy for signaling the central office. In this instrument are the following parts, which may need attention: The ringer, magneto, gravity hook contacts, receiver, transmitter, induction coil, battery and flexible coils.

There are two general types of call boxes; one in which the ringing coils, magneto and secondary circuit are each

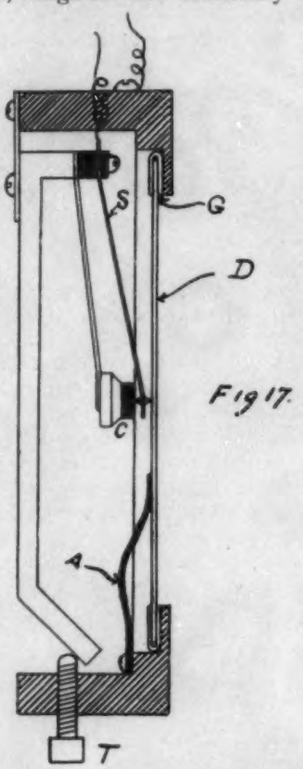


Fig 17.

bridged across the line, in the other the magneto and ringer coil are in series with each other across the line. The former kind is shown in diagram Figure 15. R represents the receiver, S the secondary winding of the induction coil; G is a magneto so arranged that when not in use it is open, but when the crank is turned the circuit is automatically closed. B represents the ringer, the coils of which are usually wound to a high resistance, generally from five hundred ohms to one thousand ohms, or even one thousand and six hundred ohms. It will be seen that there is but little to go wrong with this call box, provided good apparatus is used. Sometimes the circuit closing device on the generator or magneto does not work properly and then the signal will not operate. In the diagram it will be seen that the magneto rings through the secondary circuit and the bell circuit as well as over the line. There is a modification of this circuit on the market and in extensive use in which the act of turning the crank not only makes the magneto circuit but breaks the secondary circuit. In this signal box if the crank owing to some stiffness of motion does not return to its proper position when through ringing, the secondary circuit remains open; thus the subscriber will neither hear or make himself heard. The ringer in this bell is wound to one thousand ohms and is largely used in bridging party line service.

The other general form of signal box circuits is shown in Fig. 16. There is a shunt around the terminals of the magneto so arranged that when the crank is turned the shaft automatically removes the short circuit and cuts the magneto in series with the bell and line. When a signal or call is received the current passes into the ringer and through the magneto shunt. It should always be seen that the contact of the shunt is good, so that a call does not have to pass through

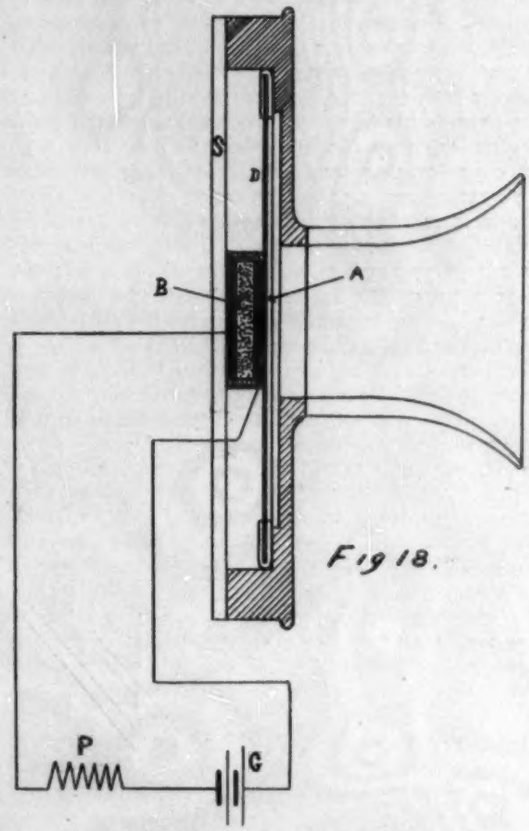


Fig 18.

the magneto. It should be seen that all spring contacts are clean and that there is sufficient tension to the springs. See also that the gravity hook moves freely. The other essential part of a telephone is the transmitter.

There are two general types of these instruments, the Blake and the Hunnings, or granular carbon transmitter. The Blake needs more attention than the other kind, but when in good order, while not as loud as some, it will articu-

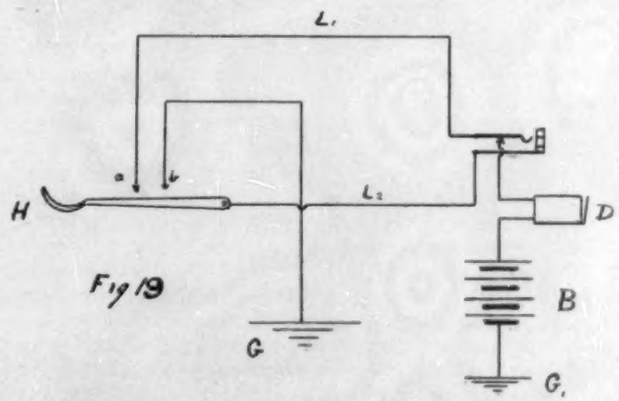


Fig 19

late much plainer. Figure 17 shows the diagram of the Blake transmitter. D is a stiff diaphragm of sheet iron. G is a gasket around the edge of the diaphragm made of elastic rubber. S is a contact spring which is in the primary circuit. This spring rests against the diaphragm and against a carbon button, C. The contact point in this spring is made of platinum. The carbon button is fastened to a spring whose tension is regulated by turning the set screw T. The spring of the carbon button is in electrical contact with the iron

frame of the instrument. A is a spring for damping the vibration of the diaphragm. It is made of stiff steel clock spring and under the end, next to the diaphragm, is a piece of soft rubber to keep the frame of the transmitter from coming into electrical contact with the diaphragm. It will be seen that it is of great importance in order to prevent short circuits, that the diaphragm be kept well insulated from all other parts of the instruments except the contact spring S. In adjusting this transmitter one should have some knowledge of the loudness of the subscriber's voice, but a very good way is to adjust it by turning up or down the tension screw till a musical hum is heard in the receiver, when the transmitter diaphragm is gently blown open. This is a very sensitive adjustment and a very loud voice close to the transmitter will cause a rattling sound; but as a large majority of users talk loudly and at the same time stand far away it will be found that this adjustment is generally the best. The rubber gasket should not be allowed to become hard, as it will cause the transmitter to sound dead or rattle. The carbon button should be kept smooth and well polished. A little hole is apt to wear or burn into the carbon, which will reduce the efficiency either by causing a harsh grating sound or deadening the transmission. In polishing the carbon button use a piece of very fine crocus cloth, hold the button flat upon it and rub with a circular motion till the roughness is removed and then

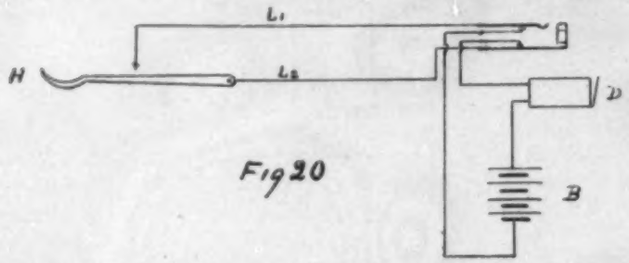


Fig 20

finish upon a worn part of the cloth. With a little patience and care this method will give a very nice finish without any scratches.

In the granular carbon type of transmitter there is need of no adjustment. This instrument consists of the following parts: (Figure 18) A is a carbon plate fastened to the diaphragm D, another plate B, directly back of this, is fastened to a support S. Between the two carbon plates is carbon in small grains C. This granular carbon is retained by some substance which insulates A from B so that all current must pass through C in passing from A to B. P is the primary of an induction coil. G is the local battery.

It sometimes happens that there is a disagreeable hissing and frying noise in a transmitter of this type. This is due in all probability to the forming of a small arc between electrodes. It is more often found to occur when there is an excess of current. If the transmitter is carefully taken apart it will generally be found that there are a number of granules sticking to one or the other carbon plates. If these granules are scraped off and the electrodes polished as explained in the case of the Blake transmitter the instrument will usually come up all right. It is quite probable that several grains of carbon range themselves in line between the two electrodes and thus form a fairly low resistance path. A great amount of current will then flow, heating the granules and forming an arc, causing the hissing sound. It has been found that this hissing occurs the least in transmitters where clean granular carbon of uniform size is used and where the electrodes are highly polished.

Packing.—A number of transmitters had a very disagreeable way of dying out while talking. Where it is not due to other sources it is due to what is called "packing," that is, the granules of carbon settle down and pack tightly between the electrodes. This trouble is in all transmitters of this type to a greater or less degree. It has been the bugbear of a number of manufacturers. To avoid packing do not have too narrow a space between electrodes. Use perfectly clean and dry granular carbon of uniform size. Do not use fine powder. Do not fill too full of granular and do not have an immense quantity. There is nothing gained by having a great amount of carbon; it is merely a heavy weight to move and is apt to make the instrument sluggish. Numerous attempts have been made to prevent packing by means of peculiar shaped electrodes, but it is doubtful if there is anything gained over the simple arrangement of two flat parallel electrodes of highly polished carbon placed parallel to each other with sufficient distance to prevent several granules from wedging across the space.

Under the head of subscribers' sets it is also well to take up central energy signaling, in which all the signaling energy is placed in the central office, as shown in diagram 19. In the diagram 19 H is the receiver hook. When the receiver is removed from the hook the contact at a and b is made connecting the ground G with the line L^1, through the hook, thus a current flows from the battery B through signal D out over the line L^1, through the contacts a and b to ground G and back to battery again. In Figure 20 the same system is used except that L^2 is used instead of ground. The ground contact b in Figure 19 does not remain connected with the hook, it is only momentarily made. When the hook rises it strikes b and then the contact is immediately broken as it passes upward.

Having given a general type of instruments the troubles of these will now be discussed.

Short Circuits.—In bridging bells the ringer coils may be at fault, the magneto or the wiring. The effect will be to cut off transmission entirely if on an individual line. In a party line this will also be the case unless there is a high resistance in the line between the stations. In the latter case the transmission will be much weakened. To find which instrument is in trouble cut off each one successively till the line works in good order. Having found the instrument cut out the ringer coils and if the trouble is still in open the magneto circuit, and if that will not cure the trouble carefully examine the wiring. Sometimes on long toll lines where there are a number of stations with a high resistance between each station the trouble of not being able to ring all the bells occurs. The nearest station may ring strong enough, the next is weaker and the rest may not be heard at all. The quickest thing which would suggest itself would be that the line was short circuited near the farther end. In that case the transmission of one or more stations would be partially or wholly cut off, but in case the transmission is good the most probable cause is that the generator is not of the correct design for bridging bell work. For this work the generator should be wound to furnish quite a large volume of current with a medium voltage. The great mistake is often made by the management in choosing a very high voltage generator. When it comes to dividing the current among a number of bridging bells there is not enough to ring them all, and on account of the high line resistance the nearer bells will ring while the farther ones are unaffected. Where the bells on the line are in series with each other a high voltage generator is used furnishing only current enough necessary to ring one bell, the voltage being great enough to force this current to ring all the bells. It may happen that the generator is of correct design, but still it does not ring the bells farther out on the line. The talking may be very good. In this case the ringer coils of the bells may be too low and there may be too many on the line. The line may be of quite a high resistance. One of the bells may be partially short circuited and cause a large share of the ringing current to pass through it. In such a case, say a thousand ohm bell is short circuited down to two hundred ohms, the talk would not be perceptibly reduced, but the line would be badly interfered with in signaling. It is not good practice to put more than a dozen instruments on one line on account of the difficulty in ringing them all even if a well designed generator is used. If more are necessary on the line, or if the line is of high resistance it will be well to use higher than one thousand ohm ringers, say sixteen hundred ohms. There are, to be sure, a large number

of lines being operated in this country where there are as many as twenty-five instruments, but one can well imagine the difficulty of keeping the line in good working order. The difficulty of catching the proper signal among such a multiplicity is alone enough to condemn such a practice.

Cannot talk to or hear the subscriber.—Not short circuited. Secondary circuit may be open. This circuit consists of a receiver, secondary winding of the induction coil and the conductors connecting the two together. The receiver may be tested by touching the binding posts to the battery. If a click is heard the receiver is all right. Now connect receiver cord to battery with the receiver in the circuit; a sharp click will show the cord is all right. In making the test of the cord it is always best, if the cord shows up good, to connect its terminals to the battery and holding the receiver to the ear shake the cord thoroughly throughout its whole length; a grating or grinding noise indicates a defective cord. The receiver and cord being in circuit test the same as before through the wiring with a jumper around the secondary winding of the induction coil. This then gives a test for the wiring. Everything thus far being right, the trouble must be in the induction coil.

Subscriber can talk, but operator cannot be heard.—Receiver cord or receiver short circuited. Test receiver by battery without cord, if battery click is heard the receiver is all right. Now connect the receiver with one terminal of the cord, the other cord terminal at the same end of the cord connect with the battery, then with the terminals of the other end of the cord separated connect the remaining post of the receiver to the battery. If a click is heard the cord is short circuited. This same trouble is produced when the diaphragm touches the magnet pole of the receiver, or in case there may be some solid substance tightly wedged under the diaphragm.

Cannot hear subscribers, but can be heard all right. Caused by,—

Secondary of induction coil short circuited.
Short circuited battery or transmitter.
Short circuit in primary coil.
Battery run down.
Open primary circuit.

First examine the battery; the zinc may be eaten off, or solution completely run down. To test the battery connect in the receiver. If the click in the ear is very strong after the battery has been short circuited for a minute the battery is in good condition. If there are a large number of crystals on the bottom of the cells or sticking to the porous cup and a strong smell of ammonia the battery is in bad condition and needs new solution and carbon element. This is in case the battery is of the LeClanche type. If the Fuller type is used there will be no ammonia smell, but crystals will be found in the bottom of the porous cup and the liquid instead of being bright red, as at first, will be very dark and of a greenish black.

If the battery is all right connect the receiver in the primary circuit to determine if open or closed by making and breaking contact at the battery. Examine the transmitter for short circuit. If everything so far is all right the trouble will be found in the induction coil primary or secondary. In either case the coil should be changed. In the Blake transmitter an open circuit may be caused by a dirty or loose carbon button, or breaking of the connections, or bad contact in the hinges.

When subscriber attempts to talk his voice cuts off and on, but without any scratching sound.—This may be caused by a swinging short circuit in the ringer coils, the magneto in bridging bells, or a bad connection, or a bad cord on the receiver, as previously described.

Cutting off accompanied by scratching sound.—Caused by loose joint or contact in primary circuit. Sometimes caused by rough or burnt button on the Blake transmitter, or in case of granular carbon transmitter by finely divided particles of carbon getting into the crevices of the transmitter carbon holder. A hissing, frying noise will be caused by too great a battery current as when the cells are newly renewed.

A rattling sound on the Blake instrument is caused by too light a tension on the carbon button.

Voice sounds far away.—Battery may need renewing. Partial short circuit in primary or secondary of the induction coil.

In each of the three above cases the receiving is all right, but the transmission is poor.

When both transmission and receiving are poor look for a high resistance or a partial short circuit on the secondary circuit, or a partial short circuit in the magneto or ringer coils.

In case the instrument makes the line noisy look for a ground on the instrument.

Can ring central but receive no call, or call is weak.

Bell is open.

Bells need adjusting.

Shunt will not close, hence will have to ring through the generator.

Ringer short circuited. In bridging bell magneto may be short circuited.

Receiver signal all right, but cannot call.—Generator shunt does not open. Magneto short circuited. Magneto open.

Can neither call or be called.

Open or short circuited ringing circuit.

In the bridging bell either a short circuited generator or ringer will cause the trouble.

In case of battery signaling if the subscriber cannot call central the cause of the instrument trouble is probably poor ground connection. In all of the above cases of instrument trouble it is supposed the lines have been tested and found to be in good condition as far as the instrument.

TELEPHONY IN AUSTRALIA.

Some time ago the governments of New South Wales, Victoria, South Australia and Queensland, conferred on the advisability of connecting their respective capitals. The advisability was conceded, but the cost was declared to be prohibitive. It was finally agreed that wires should be laid only between Brisbane, Sydney and Melbourne, and the requisite outlay was put at $200,000. The postmaster-general of Victoria is now calling for estimates for the construction of the line between Melbourne and Sydney, the original expense of which was computed at $120,000, of which $40,000 was to be borne by Victoria and the rest by New South Wales. The suggested charge for using the wire the whole distance is $1.25 for five minutes. The reason why the more extensive intercolonial proposal was deferred was the slight possibility of earning a reproductive revenue, but experience shows that if through rates are moderate local income will make up for any deficiency of income at terminals. This argument, however, is most effective when applied to a fairly densely populated country, which Australia is not. This is a defect time is fast remedying, and no doubt, the principal reason for continuing the Melbourne-Brisbane line to Adelaide, and even to Perth, when the first section is laid will be the very existence of that section.

TELEPHONE LINE OVER THE ALPS.

The Italian government has completed the installation of telephone wires on the Italian slope of the Alps, which will form part of a line connecting Rome and Paris. The work has been in progress for something like seven months, and has cost $140,000, which covers only a comparatively short stretch of line at high elevation. The French government is at work on the line on its side, and it is expected that communication will be had between the two cities during the coming summer.

THE LAW OF CORPORATIONS FROM THE STANDPOINT OF THE STOCKHOLDER.

BY GRANT NEWELL.

IV.

The advancement of civilization, the progress of commercial relations and the consequent necessity for closer intimacy and more speedy communication between points distant one from the other, have resulted in the general use of the telephone, and as in the case of the application of steam power to navigation and to travel overland, have introduced new elements into the law and made necessary not only new rules and statutes but recent decisions by the courts of last resort as well. For upon the introduction into general use of the telephone, for example, it became at once necessary for the law, speaking through the courts, to define its position and the rights, powers and liabilities of its owners and operators, not only among themselves but also with regard to the general public with whom companies organized for such purposes must, of necessity, come into business relations. Admitting as a matter of course the right of such companies to formation, to existence and to the exercise of the powers of corporations in general, we come naturally to the question of their special powers, and as determinative of this question consideration must of necessity be given first to their standing as public or as private corporations, for upon the determination of this question will depend in a large measure the powers which may of right be exercised by them. Upon this question we find that the courts have not been silent, and in well considered cases have fixed the legal status of telephone companies in this regard. Thus, in the case of Irwin vs. Great Southern Telephone Company (37 La. An. 63) we find it laid down that telephone companies fall under the same general head as do telegraph companies, that is, telephone companies are, or at least may be, public corporations, possessing the rights and powers and incurring the obligations incidental thereto.

Again, in an early case in this country (Wisconsin Telephone Company vs. Oshkosh, 62 Wis., 32) the question was whether a telephone company could be legally incorporated under a general statute providing for the incorporation of telegraph companies. It is to be noted here that there was no statute in Wisconsin expressly providing for the incorporation of telephone companies as such, and that the company in question was already incorporated and doing business. The court considered the English case of Attorney-General vs. Edison Tel. Co., 6 Q. B. Div., 244, and decided that a telephone in the law does not differ in this regard from a telegraph company. The decision in this case has been followed by the courts of last resort in many jurisdictions, among which may be mentioned Pennsylvania, Maryland and the federal courts of the United States. But this decision necessarily brought with its advantages certain accompanying disabilities. For it was speedily held that the telephone company was liable to taxation and regulation as a public corporation. (See Tel. Co. vs. Bd. of Equalization, 57 Iowa, 250.) In the case of Duke vs. Central New Jersey Telephone Company (53 N. J. L., 341) the court said: "The discovery of this method of communication (telephony) and its application to the purposes of the speedy transmission of intelligence was but a change in detail and not in substance of the business for which the companies were clothed with corporate privileges. They (referring to telegraph and telephone companies) are both servants of a public nature. A corporation employing either means of communication is exercising substantially the same public function in substantially the same way." So that we may reasonably conclude that in the law telegraph and telephone companies are identical.

Inasmuch then as the telegraph company is bound to accept all proper messages for transmission at uniform rates, the telephone company must observe the same rule. (So decided in the United States courts and in many of the states. For instance examine State vs. Neb. Tel. Co., 17 Neb., 126.)

That a telephone is a public use has thus been established beyond controversy, and the primary question of its standing in the law definitely determined.

With reference to the incorporation of telephone companies we find that but few of the states have made special provision therefor.

In Florida the general telegraph acts are applied to telephone companies. In Indiana a special telephone act exists. In Kansas such companies are included in the general incorporation acts. In Maryland, Missouri and New York the telegraph acts apply by special reference to telephone companies. In Michigan there is a special act providing for the formation of telephone companies. It is generally held by the courts of the different states that the construction, maintenance and operation of a telephone line along and over a highway creates an additional servitude for which the owner of the land underneath the highway may recover additional compensation. (See Croswell on Electric Law. Sec. 110, and cases there cited. Also Bd. of Trade Tel. Co. vs. Barnett, 107 Ill., 507. But see *contra* decision in Pierce vs. Drew, 136 Mass., 75.) In recent cases some tendency has been shown to draw distinctions between country roads and city streets with regard to the right of telephone companies to make use thereof. (Ches. & Pot. Tel. Co. vs. Mackenzie, 74, Md., 48; Lockhart vs. Ry. Co., 139 Pa. St., 419; Eels vs. Am. T. & T. Co., 143 N. Y., 133.)

In most states the statutes require a franchise to be obtained from the municipal authorities before poles can be set in the public highways of incorporated towns and villages or cities. Most of such statutes have a double effect. First, of prohibiting the use of highways in municipalities for the purpose of erecting electric lines or wires without the consent of the municipal authorities, and second, conferring upon municipal authorities the power to authorize and regulate such a use. The construction of the lines of telephone companies upon the highway must conform to the franchise under which such construction is authorized, for the use of the highway by such a corporation is subordinate to the use of the highway for general travel and public use, and the poles must be so placed as not to affect the use of the highway for the purpose for which it was originally intended. But a slight obstruction, if apparently necessary, will not be material. (Gray vs. Mutual Union Tel. Co., 12 Mo. App., 490.)

Again, if a company set poles in the highway without a franchise for this purpose such poles become a nuisance, for the maintenance of which the company is liable. (Regina vs. Tel. Co., 9 Cox C. C., 174; Commonwealth vs. Boston, 97 Mass., 558.)

In a case arising in the state of Illinois, which was submitted to the writer, the following conclusion was arrived at after a very full examination of the authorities: That where a telephone company cut a hole some twenty feet in circumference through the limbs and foliage of trees growing along and extending over the highway, for the purpose of stringing its wires, it appearing that a cutting much smaller in size would have answered every legitimate purpose, the company was liable in damages. The opinion in this case was based upon the decisions in Tissot vs. Great Southern Tel. Co., 39 La. An., 996, and W. U. Tel. Co. vs. Scatterfield, 34 Ill. App., 386. This question is one of paramount importance on account of its frequent occurrence. It so often happens that a conflict arises between telephone companies and electric light or electric

railway companies occupying jointly the same highway that the questions there arising become of importance and so have received the attention of the courts.

The strong current necessarily employed by the lighting and railway companies frequently disturbs the operation of the telephone system. It appears, however, that by the use of proper methods the telephone company may obviate this difficulty and render the proximity of the other currents comparatively harmless. This being the case the courts have almost uniformly held, irrespective of the question of priority of user or franchise, that the telephone company should make the necessary changes in its system and thus avoid the injurious effects, basing such decisions on the principle that the highway is primarily for travel and public use, and that any other purpose to which it may be put must of necessity be subservient thereto. Decisions to this effect have been rendered in New York, Pennsylvania, Ohio and Tennessee, as well as in the federal courts.

Some apology is perhaps due to the ordinary reader for the somewhat technical form which this article has assumed. It, however, seemed desirable to touch upon the points herein, and no other method of so doing presented itself to the writer. Should the reader be especially interested in any particular matter herein contained, he will not, it is believed, lack the means of obtaining from his friends of the legal fraternity such explanations as may be necessary to assist him. Our next article will treat of the liability of telephone companies for injuries to the property of others arising from negligence in the conduct of the affairs of such companies.

QUESTIONS AND ANSWERS.

Exchange men are invited to submit to the editor of this department questions of general interest, which will be promptly answered. Address all communications to Question and Answer Department, Telephony.

We are in receipt of a letter from R. L. D. Jr.:

(1) "Can you ring through a repeating coil on lines having eight or ten telephones on each side of the repeating coil? If not, what is the limit of ringing through a coil?"

(2) "What is the best method of connecting, by means of strap or pole changing switches, or plugs and jacks a series grounded to a series or bridged metallic line? Also a bridged grounded line to series or bridged metallic line, so that each side may ring off all right."

(3) "What is the best method of wiring a bridged metallic private line to a bridged metallic toll line, and a series metallic private line to a bridged metallic toll line, using strap or pole changing switches?"

(4) "The Bell Company have erected some pole lines, using what they call the 'loop system.' It appears to be a bridged metallic circuit with four wires run in at each station. You ring in to central with the receiver off the hook. Is not the switching apparatus in the 'phone similar to the diagram given in the March TELEPHONY in answer to A. B. T.?"

In answer to case (1) will say that if the repeating coil is properly designed there is no reason why the bells will not ring on each side, though it is pretty severe a test for the coil. Eight or ten 'phones on each side of the coil is very poor telephone practice. In fact, without the coil it is not advisable to put so many instruments on the line. There is, of course, a limit of ringing through the coil. As a repeating coil is not a perfect transformer it can never give even in the best case as good an efficiency as the bare line.

(2) Fig. 1 shows the method of connecting either a series or bridge grounded line to either a series or bridged metallic line. A represents the grounded line coming into the jack B at the exchange. D is the drop corresponding to this line. G is the jack of the metallic line H and C the drop. The line A comes into the jack on the tip spring, while the sleeve side is run to ground. A metallic cord ending in the plugs P and E is used to connect the two lines. F is a clearing-out drop bridged across the cord. Now, in ringing off with A the current passes along the line through the tip spring of B through tip side of cord through drop F back on sleeve strand of cord to ground at the sleeve connection of the jack, and thence through ground, completing the circuit. In like manner H may ring off. There may be one difficulty. If the drop F is of high resistance while the bell on A is low, H may have trouble in ringing off, because the greater part of the current would flow past the clearing-out drop through the low resistance bell. The way to get around this is to use a clearing-out drop of comparatively low resistance, say about three hundred ohms. There would not be any perceptible loss of transmission from such a low-wound drop, because its impedance to a talking current is so great. There has been a large demand on the part of many telephone users for very high-wound clearing-out drops, even where there are low-wound series bells. This is only a useless expense and is very apt to cause trouble. When the Bell people first put in their 600-ohm clearing-out drops, bridged across the cords, they found that they had to change every one of their 80-ohm ringers and put in those wound to 500 ohms, so as to make the clearing-out drops work properly.

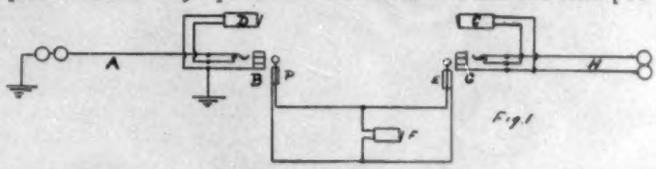


Fig 1

(3) Fig. 2 shows what is probably as good a method as any for wiring a series or bridged private line to a bridged toll line. A represents the toll line. E is the private line running to the contacts of a two-lever switch S. Two taps are connected into the pivots of the switch and are run, one to each side of another switch F. D is an extension bell bridged across F at the toll line side. B is a telephone instrument connected to the pivots of S. Now, normally, F is open and S is connected to the line E. When the toll line calls the extension bell D will ring. When E calls the telephone B will ring. To connect E to A close F. For B to talk to E alone F is open. For B to talk to A only F is closed, and S is thrown to the right. The bell of B should be run to line E and be bridged permanently across.

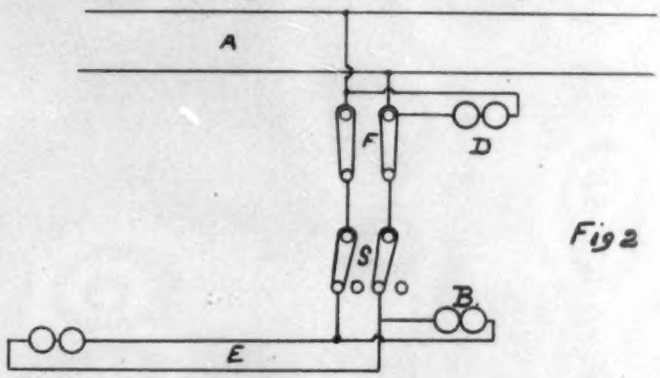


Fig 2

(4) The loop system of which you speak may be arranged similar to the diagram, but unless the lines go to a switchboard it is probably not the case. The Bell people have a bridging toll line system in which each party can ring only into the exchange at the one end of the line. As it often happens, there is an exchange at each end, and to ring both would cause confusion, so when they ring the instrument automatically opens the line and allows the party to ring in only one direction. This gives one operator entire supervision and prevents dead-head talking. One reason the receiver is off the hook when ringing is that the party is more apt to put it to his ear to see if anybody is on the line before ringing.

A. R. M. asks whether it is necessary to have more than one ground where a number of toll lines come into one board, all of which lines are grounded. The board is of the metallic circuit kind. One ground is a great sufficiency, but it should be very good in any case.

READING AN ELECTRICAL DIAGRAM.

BY A. E. DOBBS.

(Continued.)

Figure 8 brings up another kind of coil known as a retardation coil, frequently shown not only in central battery work but also in combined telegraphy and telephony over the same wires.

Suppose, for example, that we wished to use a telegraph instrument on a metallic circuit telephone line or a combination of two lines. By bridging across the line with the coil C for example, if wound to sufficiently high resistance it would prevent voice currents from crossing from one side of one line to the other, in the same manner as a bridging bell, while a third telephone tapped on the middle wire would meet with very little impedance in the coil for the reason that the current spreading out both ways from the center would have no magnetic effect on the coil as one end would neutralize the other. The three forms are used interchangeably, but the form C is used only where it is necessary to call attention to the fact that the coil is inductive.

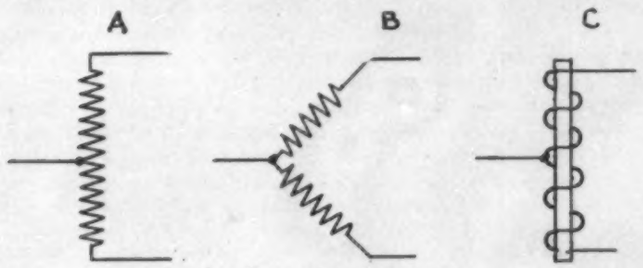


FIG. 8—IMPEDENCE COILS.

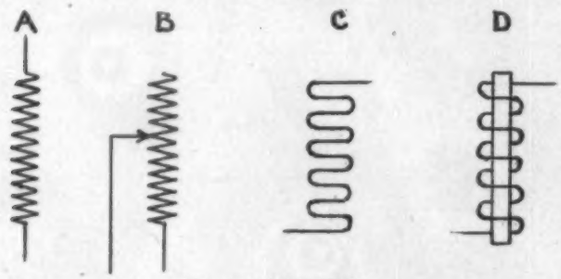


FIG. 9—RESISTANCES.

Figure 9 shows four different ways of representing a resistance, the most common being that shown at A, while B represents a variable resistance, as shown by the movable point on the outside, which is supposed to slide forward or back over the coil. This may also be used to represent a rheostat.

Now the resistance shown at A and B may be inductive or non-inductive, and where it is desired to show an inductive resistance some of the Western Electric draftsmen use the form shown at C. At the same time in order to remove any possible misunderstanding on the subject it is just as easy to make the form D, which should always be used when necessary to emphasize the fact of its being an inductive resistance. This leaves no possible chance for a misunderstanding.

While on the subject of inductive coils and resistances we will consider three more shown in Fig. 10.

A is a variable inductive resistance or solenoid, that is, one in which the magnetic effect is increased or decreased by the moving in or out of its iron core. It is sometimes called a choke coil and is used in alternating current work and may, for example, be used to represent a theater dimmer.

B is another form of coil which is shielded as in the case of certain well-known forms of medical coils in which the current in the secondary may be increased or decreased by the moving in or out of a shield around the core.

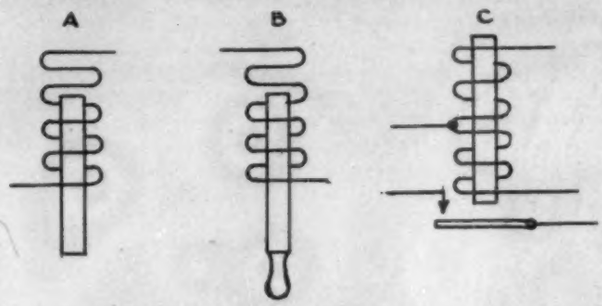


FIG. 10—CHOKE COILS.

C represents a differential relay, that is, a relay that may be magnetized by a current in either direction, and owing to the fact that its windings oppose each other it may be magnetized instantly in either direction and in this way keep a closed circuit to even an alternating current.

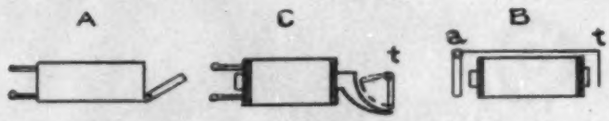


FIG. 11—SWITCHBOARD DROPS.

This figure (11) shows three forms of drops in common use which, of course, can be varied to suit special forms. If special forms of drops are shown, however, there should be at least one of them drawn out in full so that its workings can be the more readily understood.

A represents the ordinary magneto call drop, and is, of course, more or less familiar to everybody.

The drop shown at B, however, shows a different action. It will be apparent that when the armature a is drawn up the target t will be raised up instead of falling down, as in the case of the one shown at A, and this is precisely the action that takes place in central battery systems. It is, therefore, a central battery drop. The drop shown at C has puzzled a great many students in studying Western Electric drawings, and its action may be explained as follows: It is a central battery drop and when energized the target t raises toward the center. As shown in the drawing the drop is at rest, but if shown as pointing toward the center it would indicate that a signal is being shown.

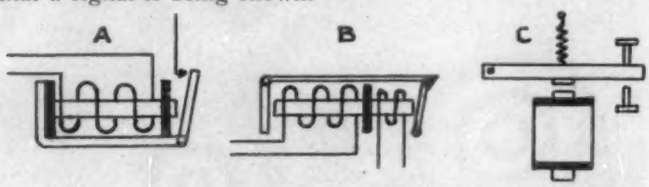


FIG. 12—RELAYS AND SPECIAL FORMS.

Figure 12 gives us some special forms of relays and drops. The first (A) shows a polarized relay, that is, a relay that will respond only to currents of a certain direction, and if necessary to indicate the current it would be done by placing the sign + or — over it. By leaving out the armature contact it would stand for a drop as well as a relay.

B indicates an electrical self-restoring drop of the Scribner pattern which is drawn back to place by the placing of a plug in the jack. This is a special form and may be varied according to circumstances and the circuit used.

C is a telegraph sounder or a switchboard buzzer.

These may show telegraphic or switchboard relays. Polarized and differential relays have already been shown, one in Fig. 12 A, and the other in Fig. 10 C, and they need very

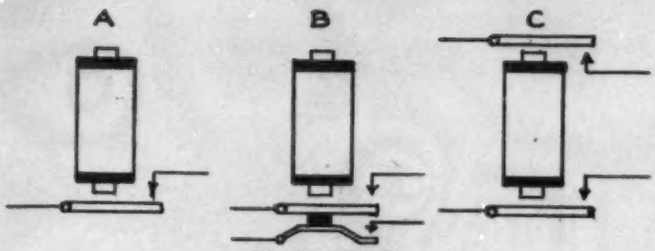


FIG. 13—RELAYS.

little explanation. Should it be desirable to represent one of these as a polarized relay it would be necessary to show a permanent magnet at the side, as in 12 A.

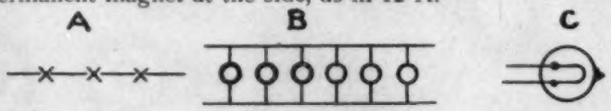


FIG. 14—LAMP SIGNALS.

While dealing with switchboard signals it is just as well to include all electric lamp signs. Thus, in Fig. 14 A, is an arc lamp circuit B, an incandescent lamp circuit and C, a switchboard lamp which may be indicated as burning by having lines radiating out from it. In the case of B, the lamps shown by heavy lines are turned off while those lights are turned on. In some diagrams this may be a matter of some importance.

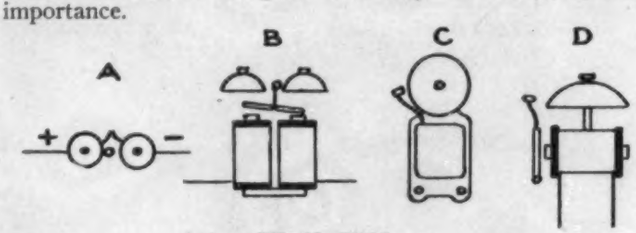


FIG. 15—BELLS.

A and B show the ordinary magnetic bell, either one of which is correct.

As the polarized bell, that is, a bell that will respond to a current in only one direction—is made in the same form, the difference can be indicated by placing the signs + or — over them to indicate the direction of current that they will respond to. C is the well-known vibrating bell, while D represents a single stroke bell as used in district telegraph work.

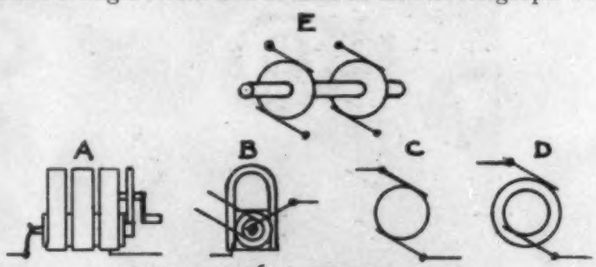


FIG. 16—GENERATORS.

First (A) we have the ordinary hand generator and at B, the belt driven alternator, which is sometimes also represented by D. The latter, however, is more often applied to dynamos, as is also the form C, which may be any direct current generator or motor. If necessary to distinguish between a motor or generator the letters M or G may be placed immediately over them.

E is the conventional method, although a more common form would be a representation of an armature with collector rings on one end and a commutator on the other.

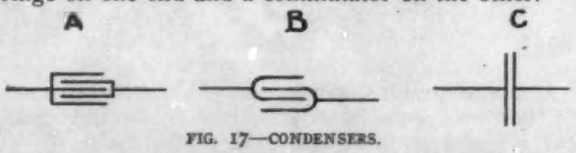


FIG. 17—CONDENSERS.

A and B show the two forms most in use in representing condensers, although the form C is met with occasionally. As it is, however, a little vague it should not be used at all. and is merely given that the reader may recognize it when he sees it.

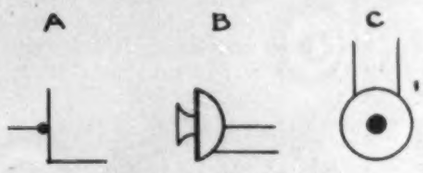


FIG. 18—TRANSMITTERS.

All three of these forms are in common use and all equally plain. The Chicago Electrical Association recommended the form shown at A, but the others are really plainer to read, as there is then no question as to what is meant.

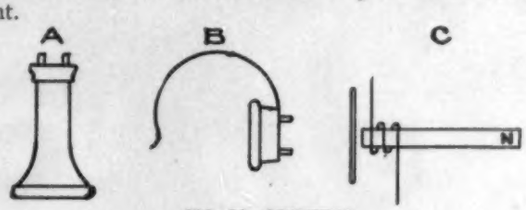


FIG. 19—RECEIVERS.

These tell their own story. The form C is old and not often seen now.

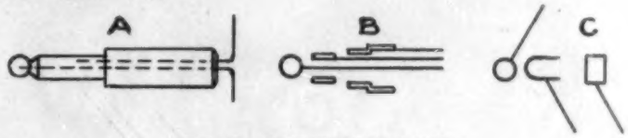


FIG. 20—SWITCHBOARD PLUGS.

These give the common forms of two and three conductor plugs in most common use.

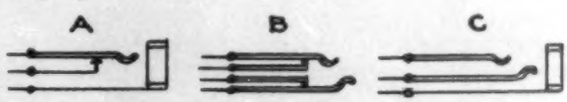


FIG. 21—JACKS.

A is the ordinary single tip jack, while B is a jack that cuts the drop out on both sides, and C a form of open jack often shown in connection with multiple boards.

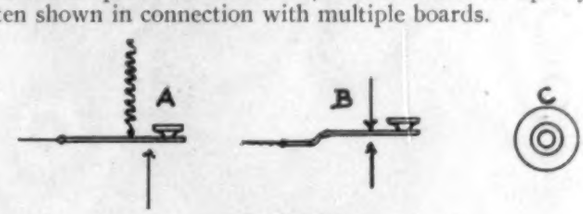


FIG. 22—KEYS.

The first figure is the ordinary telegraph key, while the second is shown as a strap key, but might represent an ordinary push button of the double contact kind. The push button shown at C is generally represented as a strap key.

FIG. 23—VARIOUS AUXILIARY APPLIANCES.

A is a figure that might represent either a ringing or listening cam, the differences being indicated only by the connecting apparatus. Thus, if an operator's head receiver should be connected to the two outside contacts we would know that it was a listening key.

In switchboard diagrams the listening and ringing keys

are often represented as being in different parts of the cord circuit in order to save the bunching of the lines and make the diagram clearer, and, for the sake of simplicity, the operator's head receiver is shown connected to one key while the generator circuit is sometimes omitted altogether from the points of the other key, that being understood.

B represents a simple fuse and does not apply to special forms.

C is a rheostat which is only an elaboration of that given in Fig. 9 A.

D and E show two forms of lightning arrester, one being the saw tooth and the other the common form of carbon arrester.

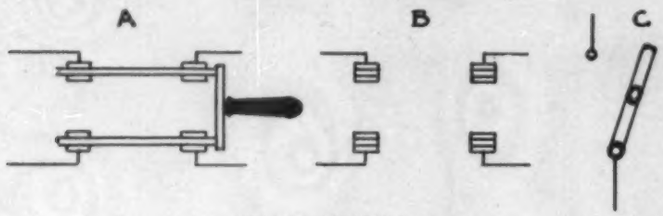


FIG. 24—SWITCHES.

A is the common form of knife switch closed, while B shows the same open, the blades in the latter case being omitted from the drawing.

C is the ordinary dial switch which as in interior telephone systems may be made to include a large number of points.

FIG. 25—MEASURING INSTRUMENTS.

A is either a polarity indicator or a galvanometer. A galvanometer is frequently represented by a circle in the center of which is a G, but the form given above is just as easy to make and admits of no misunderstanding.

The others, ammeter, voltmeter and wattmeter, are indicated by their initial letters.

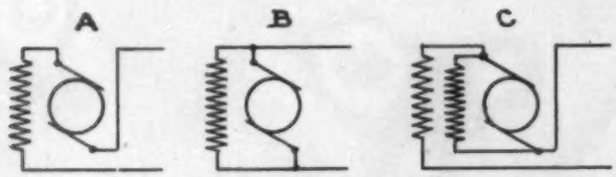


FIG. 26—DYNAMOS AND MOTORS.

As a telephone man in these days of central battery systems must be acquainted with dynamos and motors, to a greater or less extent, the circuit drawings of these are also given. In the first (A) we have the series dynamo in which the armature is represented by a circle and two brushes. (commutator), and the field winding by the coil placed at one side. In this case the armature winding is understood so that it is not necessary to give that. When it is necessary to show the armature winding it is done on a plane surface and in a separate place.

Thus, in A, we have a series dynamo, one in which the circuit is not divided, but passes through the field and armature in series as its name indicates. B is the shunt motor or generator, usually built for 110 and 220 volt circuits in which the most of the current goes through the armature, while the field being of comparatively high resistance is placed across the circuit in bridge and takes a comparatively small portion of the current.

C is a compound wound machine, one in which there are two windings, one being the simple shunt winding, which, however, allows the current to fall down when the load rises, which is compensated for, by taking a few turns of the main circuit around the field, which in this way is made stronger as the number of amperes in the circuit increases. In this way the voltage of the machine can be maintained constant through a wide variation of load.

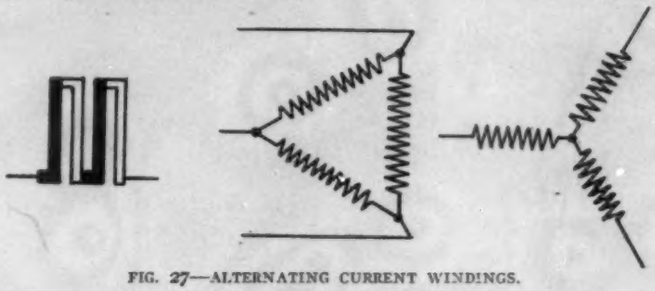


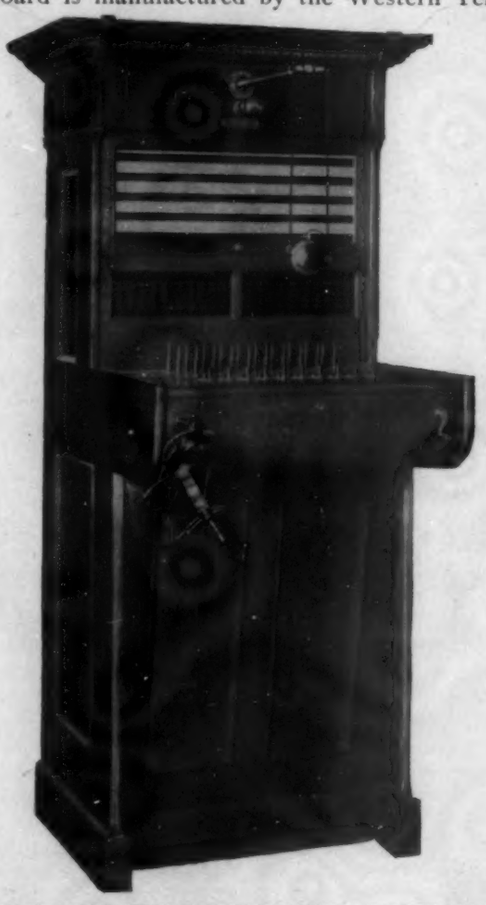
FIG. 27—ALTERNATING CURRENT WINDINGS.

There are several different ways of showing these windings, only two of which are given, both applying to triphase machines. The first (A) shows what is known as the star winding, and the latter the triangular or delta winding, and are only given as examples in this connection.

C, however, brings us to something different, known as a thermo electric generator, that is, one in which different metals when welded together will give out an electric current when heated. As some of these devices have been placed on the market they are worth noting. The light and shaded parts suggest the different metals.

A NEW CENTRAL BATTERY SWITCHBOARD.

The accompanying cut illustrates a new type of common battery switchboard for small exchanges. This switchboard is manufactured by the Western Telephone



ONE HUNDRED SECTION CENTRAL BATTERY SWITCHBOARD.

Construction Company of Chicago, and in its construction it embodies all the new features of that company's large multiple switchboards, which it has recently installed in some of the large cities in the East.

The subscriber's line signals are of the mechanical

visual type. The clearing-out signals are small, miniature lamps, mounted in the key-shelf directly in front of the answering and connecting cords. The operation of this board is as follows:

When the receiver is removed from the hook the visual signal, with a number attached, showing the subscriber's telephone number that is calling the office, is raised to view, and a small pilot lamp at the top of the signal is lighted. When the operator inserts the plug to answer the subscriber, the visual restores to its normal position and the pilot lamp is extinguished. After inquiring for the number desired, she inserts the plug in the line jack called for and rings the bell. When the subscribers have finished talking and wish to be disconnected they simply hang the receivers upon the hooks of their respective telephones. This act operates a relay, which lights the small red lamp directly in front of the pair of cords used in the connection.

This system can be used for either common return, grounded or metallic circuits, or the three combined. This is claimed to be the most compact common battery switchboard that has yet been assembled.

The auxiliary apparatus used, such as relays, and, in fact, all the apparatus necessary to operate the system, with the exception of the batteries, are mounted within the board.

The switchboard is so wired that anybody can connect it up ready for service in a few hours.

The "Western" is also making up a new combination central battery and magneto-cell switchboard. In this board the Western express drop is used, the wiring of the drop itself being changed to conform with either a central call or a magneto line, and can be changed to either a full magneto board or central battery call, without going to the expense of buying any additional apparatus. The requirements to changes the board necessitates only the changing of two wires in the drop.

THE CHICAGO EXPRESS SWITCHBOARD.

The Chicago express switchboard (Fig. 1) is presented by the Chicago Telephone Supply Company for consideration as embodying many features in central station apparatus which are good and up-to-date.

Details of transfer or multiple systems for boards of any size will be submitted on application. As each section is assembled under the personal direction of the designer and inventor, who was for many years in the experimental department of the Bell Telephone Company, every section which leaves the factory is claimed to be both electrically and mechanically correct.

The drop and jack (Fig. 2) are self-contained and can be removed from board. The standardized Bell drop and jack are used in connection with an original drop restorer, which mechanically restores the drop shutter wehn plug is inserted in jack. The parts of drop and jack are mounted on a punching of annealed Norway iron, and all soft iron parts are made of the same material, thus positively freeing the board from residual magnetism. This punching has the drop placed above it, and the jack below; the edge on either side extends past the other parts to engage a groove in cabinet.

The armature is punched from a 3-16-inch piece of annealed Norway iron, and is pivoted in such a manner as to be exceptionally sensitive.

All insulation is of hard rubber. This is true of every contact of every kind throughout the entire board.

The drop shutter is a heavy punching, made of brass and finished in copper, oxidized dead black. A projection extends from the lower end of shutter past the hinge. When the shutter falls this projection completes the night-bell circuit by coming in contact with a night-bell rod mounted on each drop as closely as possible to the shutter. The entire weight of shutter is therefore utilized to make good the night-bell contact. The metal front of drop, against which the shutter rests when in normal position, is finished in lacquered brass. The contrast in finish between the shutter and front of drop is appreciated by operators.

The jack parts are mounted on hard rubber below

FIG. 1.

the drop frame. The springs are made of spring German silver, and are so arranged that the insertion of plug will cut the drop out of circuit.

The drop restorer, as its name implies, automatically restores the shutter when plug is inserted in jack. The restorer is extremely simple in design, consisting of a slide bent down behind to engage the plug and bent up

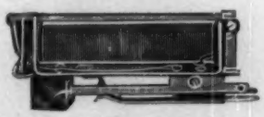


FIG. 2.

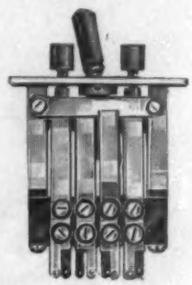


FIG. 3.

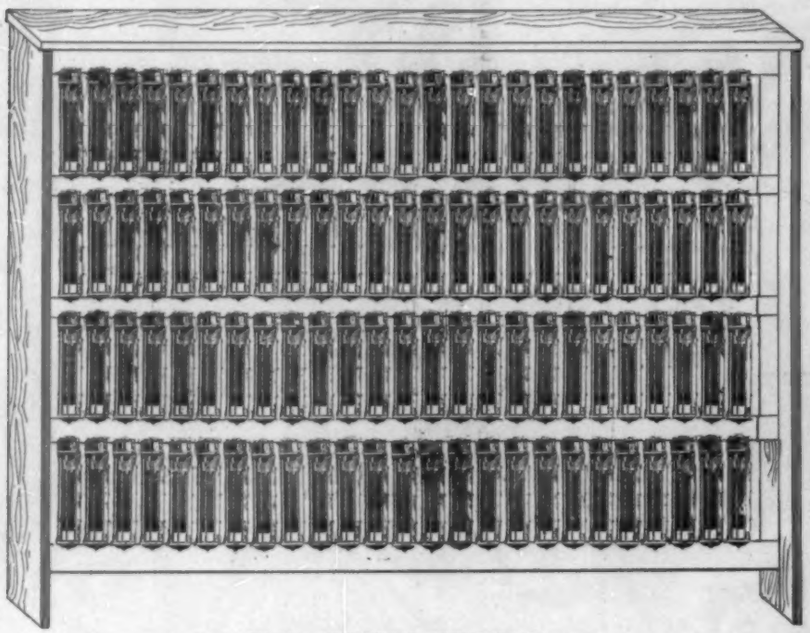
in front to engage the shutter. From the very nature of its construction it cannot fail to work every time. No complicated mechanism is used in restoring the Chicago drop.

The operator's key (Fig. 3) is a radical improvement on existing forms. It is original in every detail and is good beyond criticism. The cord springs normally rest in contact with two bus bars, each of which ties together

one side of the two cords. The receiver, or secondary circuit, is attached to two springs normally out of circuit, but which are bridged between the cord bus bars when the lever is pressed forward. The generator circuit is attached to two springs, which are connected with two bus bars, one on either side. Pressing either push button will break the circuit between the cord springs and the cord bus bars. It will further make contact between the cord springs and the generator bus bars, thus throwing the generator current on the cord and line. The simplicity of this key, as well as its mechanical merit, will at once appeal to experienced telephone men.

The drop, jack and key of a switchboard determine its possibilities and limitations. These parts must be of such construction as to insure rapidity and efficiency. They must be self-contained and easily removed from the board. The Chicago drop, jack and key embody all these qualities.

The general construction is in keeping with the parts described. The cabinet is made of quarter-sawed oak; the space for one hundred drops and jacks is fifteen inches square. The operators' shell is thirty inches from the floor, rendering it convenient for the operator to occupy



GLOBE AUTOMATIC SWITCHBOARD.

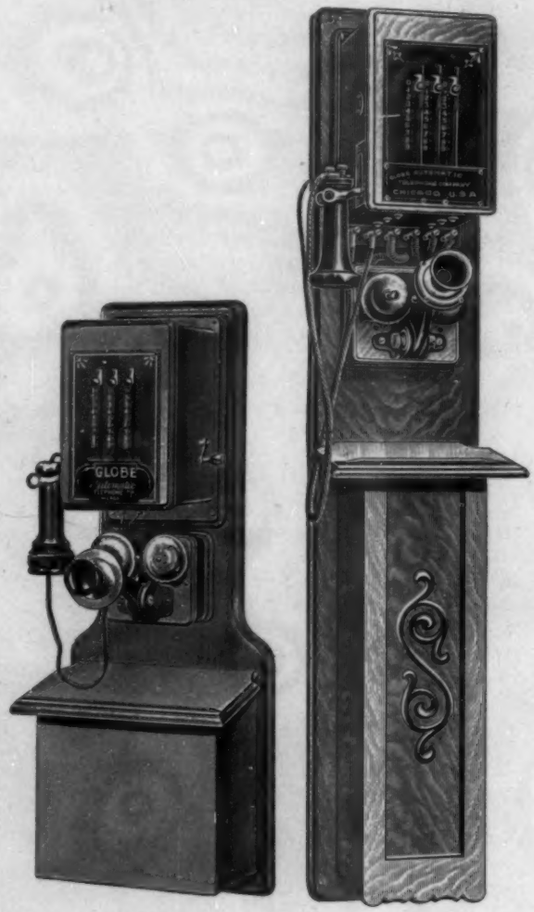


FIG. 2. GLOBE TELEPHONES. FIG. 1.

an ordinary chair. The operator's transmitter will be mounted on an adjustable arm or on swinging cords, as preferred by the purchaser. The generator is large and powerful. It will ring satisfactorily over bridging party lines, as well as over local lines.

The headband receiver cord is attached to a plug, which, when removed from the operator's jack, not only cuts out the receiver, but also cuts the batteries out of circuit. This renders it possible to use open circuit batteries if desired.

The board is of the metallic circuit type, thus rendering it possible to use metallic circuit, common return, grounded lines or a combination of all three.

It will be observed that originality and perfection of design is embodied in the best mechanical form to produce efficiency and longevity. Further, the extreme care used in securing good insulation and avoiding the possibility of induction positively prevents cross talk.

GLOBE AUTOMATIC APPARATUS.

The advantages claimed for the Globe system over others of this class are many. Of most importance perhaps is the fact that by their method they claim not to depend upon electrical energy for the movements of their switchboard, but merely to control a stored energy, requiring a very small amount of current, thus avoiding the disastrous effects of heavy currents on lines and contacts. It also avoids the continuous expense of maintaining large battery or other source of electrical energy, and avoids all trouble arising from that source, which is universally conceded to be of no small magnitude. Another very important feature claimed is the stability of the mechanism, made possible by this method, requiring no delicate or sensitive parts, making the movements positive and contacts firm, while the energy required is maintained practically without cost.

In the accompanying illustration is shown a 100 section of a 500 capacity automatic switchboard. Fig. 1 represents one of the automatic telephones. Each telephone, it is noticed, has a keyboard, by the use of which the subscriber secures connection with any number wanted. The keys to the right hand side are termed units, the next tens and the next hundreds. Keyboards are equipped with more keys where exchanges require larger capacities. By this admirable arrangement all that is necessary to call a number—for instance, 475—is to place the keys, beginning at the left-hand side, on four, seven and five, respectively. Then remove the receiver from the hook and ring in the usual manner. Thus it is seen that no experience is necessary to use the instruments and that mistakes are impossible, as the number to be called can be seen indicated on the face of the keyboard. If the line of the party called is in use, then the bell will not ring, thus indicating that the line wanted is busy. Conversations where this system is used are stated to be absolutely private, as the apparatus will not

make connections with a busy line. This in itself is an admirable feature, especially in small exchanges.

The selective party line and toll telephone, as illustrated by Fig. 2, is made especially for the use of lines where first-class service is required, and is an excellent arrangement for large exchanges where several telephones are placed on each circuit commonly called party lines. By the use of these instruments any particular one of several can be called without ringing any bell but the one wanted, though they are all connected on the same wire. Not only does it avoid ringing all the bells, but it actually disconnects all but the one wanted, so that no one can hear or interfere during a conversation. Also when any one of several on a line of this kind rings, his is the only bell that rings, and the operator, or person in charge, receives the signal and makes the desired connection; thus the service is equal to private lines, though the cost is reduced to a minimum. Each instrument is equipped with an indicator, which signifies to the subscriber whether or not the line is in use. Should he disregard this indication and try to ring, no harm would be done his bell would not ring and no connection would be made.

NEW TELEPHONE HEADQUARTERS.

The Farr Telephone and Construction Supply Company, Chicago, has recently removed to the new and modern electrical building, corner Jackson boulevard and Des-

ELECTRICAL BUILDING.

plaines street, where it occupies largely increased quarters. The company's business has grown to such proportions that it was found necessary to secure more room. The new location gives ample facilities for handling all orders promptly. Cut of the electrical building is shown herewith.

TRADE NOTES.

Manufacturers are requested to send to this department such advertising matter as they may issue, which will be noted in these columns. Address same to Trade Note Department, Telephony.

THE AMERICAN ELECTRIC FUSE COMPANY, Chicago, New York and San Francisco, announces it has more than doubled its capacity, and has installed new machinery for turning out its well-known specialties. The company is making improvements upon its standard line of fuses, fuse boxes, lightning arresters and connectors, and is in position to fill all orders promptly. A full line of magnet wire is manufactured by the company, of which a complete stock, of all sizes, is kept constantly on hand. Mr. W. B. McCudy has charge of the eastern office, with headquarters at 116 Nassau street, New York. A complete line of all products is kept in stock at the New York, Chicago and San Francisco offices. Catalogues, samples or any desired information will be gladly furnished upon request.

THE ILLINOIS ELECTRIC COMPANY, Chicago, has just issued a new price list, No. 14; also a pamphlet describing its bridging and series telephones, which it will be pleased to furnish upon application. The company is receiving many inquiries and orders.

THE AMERICAN ELECTRIC FUSE COMPANY has recently gotten out a very attractive booklet, entitled "Hints" by 'Fuse." It is profusely illustrated, and contains, as its title implies, hints which will be found valuable to anyone interested in the telephone business. It will be sent free upon request.

THE NATIONAL AUTOMATIC TELEPHONE COMPANY, Chicago, reports a very heavy spring trade, and has had to increase its facilities to take care of its orders. It is now in position to get all orders out promptly, and would be pleased to submit descriptive matter and prices upon application.

THE ACME ELECTRIC COMPANY, 231 South Canal Street, Chicago, has just issued a new catalogue illustrating and describing its product. The company's new magneto bell is given special prominence and cuts are shown of the complete line of apparatus manufactured. A great deal is claimed for Acme apparatus, and prospective buyers are requested to send for catalogue and prices.

THE DEARBORN ELECTRIC COMPANY, Chicago, has removed to 122-124 West Jackson Boulevard, where it will have large and commodious quarters for conducting its large and growing business. The company carries a complete stock of telephones and telephone supplies and would be glad to furnish prices upon request. The company has just issued a new telephone catalogue, which will be mailed to anyone interested in telephone work.

THE ERICSSON TELEPHONE COMPANY, 296 Broadway, New York, has just issued part five of its well-known "Ericsson series." The booklet is devoted almost entirely to transposition of wires, and is illustrated with a number of diagrams. An interesting article on the telephone in Switzerland is given. A cut of the three-hundred number Ericsson switchboard recently installed at Pittsburg, Kansas, is also shown. The booklet will be sent free to anyone writing for it.

THE GILLILAND ELECTRIC COMPANY, Adrian, Mich., reports its factory running full time and a great many orders on hand, having received among others an order from the A. B. Dick Company, manufacturers of the Edison mimeograph, for cabinet work. The Gilliland company is prepared to take care of any kind of special wood or metal work, and to manufacture at a low cost a complete line of electrical specialties, telephone parts, etc. The company will be glad to receive inquiries and specifications from anyone interested.

THE GARTON-DANIELS COMPANY, Keokuk, Iowa, reports an increased demand for its telephone extension circuit devices. They are being used particularly on party lines where their automatic features are in great demand. They are also used on magneto fire alarm systems and in various other ways. One of the leading telephone manufacturers, after testing these devices, said: "We tested the strength of the hammer stroke through an artificial resistance of three thousand ohms and found that the circuit ringer operated satisfactorily." This indicates how delicate and reliable the devices are.

INDEPENDENT TELEPHONE EXCHANGE OF AURORA, ILLINOIS.

BY E. R. CONKLIN

The Independent telephone exchange, recently opened at Aurora, Ill., by the Northwestern Telephone Company, shows strong work in this line around Chicago.

The Northwestern Telephone Company was organized in July, 1899, and incorporated with a capital stock of $250,000, which was increased in March, 1900, to $500,000.

The Independent telephone work in this section was started against the strongest opposition of the old company by E. R. Conklin, present secretary of the company, who had entire charge of the work previous to the construction of the exchanges.

Mr. Conklin, previous to the organization of his present company, organized a company and built a plant at Lockport, which, at the present time, is a part of the Northwestern Telephone Company.

The company contemplates covering well all the territory in Will and Kane counties, from Elgin to Lockport, and has already established small exchanges, besides their plant at Aurora, at Plainfield, Sugar Grove, Big Rock, Kaneville, Elburn and Geneva, and several hundred miles of trunk and toll lines and country party lines, as well as having an exchange at Joliet practically completed.

The company has as its principal stockholders and officers: Will Christy, president, of Akron, Ohio; E. J. Clapp, vice-president, Warren, Ohio; J. R. Nutt, treasurer, Akron, Ohio; all of whom are identified with many of the largest Independent exchanges in Ohio, as well as having heavy interests in street railway works and other lines.

The construction work of the company is being done by the Conklin Construction Company, under the personal management of A. B. Conklin, president.

The exchange at Aurora is considered one of the best constructed and most modernly equipped exchanges in the Independent field.

All wires in the entire fire district of the city are in underground conduits, having over 75,000 feet of trench with 40,000 duct feet of conduit. The ærial wires are largely in cable, and in the entire exchange there are no places where more than three cross arms are used for open wire.

FIG. 1—ONE THOUSAND NUMBER SWITCHBOARD.

The equipment, furnished by the Stromberg-Carlson Telephone Manufacturing Company, of Chicago, is of a central energy type. The switchboard, shown in Fig. 1, is a strictly multiple board with visual line signals. The board has a capacity for 1,000 subscribers. Fig. 2 shows the chief operator's desk and the toll line switchboard.

The toll lines and country party lines are equipped with a divided circuit central checking system, where all calls must go to the central office before another subscriber can be signaled.

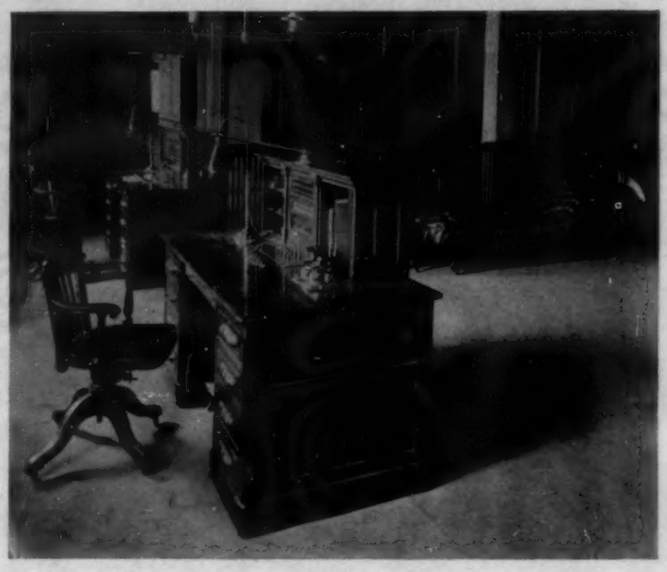


FIG. 2—CHIEF OPERATOR'S DESK.

Fig. 3 shows the lightning arrester board, which is equipped with the S-C slate base heat wire lightning arrester.

The power plant consists of twenty cells of storage

FIG. 3—LIGHTNING ARRESTER BOARD.

battery in duplicate, with necessary charging machines and ringing generators, which are controlled from proper power switchboard.

The exchange is meeting with remarkable success, and is rapidly increasing, and promises to be one of the strong Independent exchanges in the field.

WHAT A HUNDRED YEARS WILL BRING.

Wireless telephone and telegraph circuits will span the world in the next hundred years, according to a writer in a recent number of the Ladies' Home Journal. A husband in the middle of the Atlantic ocean will be able to converse with his wife sitting in her boudoir in Chicago or San Francisco. We will be able to telephone to China or South Africa quite as rapidly as we now talk from New York to Brooklyn. By some arrangement of automatic signals they will be able to connect with any circuit in their locality without the intervention of "hello girl."

A BIOGRAPHICAL SKETCH OF A. B. CONKLIN PRESIDENT OF THE CONKLIN CONSTRUCTION COMPANY.

Mr. A. B. Conklin, whose portrait is shown below, started in the Independent telephone business early in 1895 at Wasseon, Ohio, a town whose people are represented in many independent constructing and operating companies. Mr. Conklin was one of the originators and organizers of the Independent exchange established at Wasseon in 1895, an exchange that now has about 300 subscribers in a town of 2,200 population, or one telephone to a little less than eight inhabitants. When the exchange at Wasseon had been established he took up the work in 1896 of organizing and establishing an ex-

A. B. CONKLIN.

change at Adrian, Mich. Early in 1897 he organized an exchange at Washington C. H., Ohio, a plant that now has about 1,000 subscribers in a town of less than 10,000 inhabitants. In 1897 and 1898 he organized the Warren and Niles Telephone Company, which has exchanges in a number of towns and a large amount of country toll lines. Late in 1898 he managed the construction work in rebuilding the exchange at Youngstown, Ohio. In the year following he was one of the organizers and secretary of the Akron People's Telephone Company, and had personal management of the construction work of that exchange. He then organized the Conklin Construction Company and took a contract for building the entire system of the Northwestern Telephone Company at Joliet, who have built and are establishing exchanges at Aurora, Joliet, Elgin and Geneva, Ill., and covering the counties of Will and Kane with a network of toll lines, country party lines and small village exchanges.

Mr. Conklin is practical and thorough in all his work and believes in sparing no expense in establishing Independent exchanges, and is putting in systems that cannot be surpassed.

A TERRIFIC ICE AND SLEET STORM THROUGHOUT MICHIGAN.

BY F. N. CARROLL.

The severest storm known in many years struck Battle Creek, Mich., on the night of March 9, continuing throughout the 10th, in which rain, sleet, ice and wind played havoc with poles and wires, and all means of rapid transit and communication were cut off.

Early Sunday morning the rear end of a southwestern blizard reached Michigan, and within a few hours' time did immense damage to farm and city property, paralyzing telephone and telegraph service throughout the state, greatly interfering with railroad travel and disabling news service of the daily papers.

All efforts failed to get a message through to the news sources in Chicago by telegraph, or by long-distance 'phone connections with other outside points. Only one wire was open in the Postal Telegraph Company's line, and that was with Detroit. A large number of their poles were blown down between Battle Creek and Kalamazoo, shutting off communication with the West. A large force of men started west the following day to make repairs. The railroad wires of all roads were down, and the Michigan Central only got their train dispatcher's line open at six o'clock Sunday evening. By means of through 'phone connections it was learned that St. Joseph, Benton Harbor, Grand Haven, Ionia, Coldwater and Kalamazoo also suffered about as Battle Creek did, their overhead wire systems being practically useless by the breaking of poles and snapping of thousands of wires.

About seven o'clock the following morning the network of overhead wires and cables of the Bell Company, whose property suffered immense damage, especially on East Main street from Madison avenue to the soldiers' monument, fell to the pavement, a twisted, tangled, broken mass of wreckage, fully illustrated by the accompanying half-tones, which were produced from photographs taken a few minutes after the breakdown occurred, and for the use of which we are indebted to the Battle Creek Morning Enquirer.

The excellent illustrations tell the story of wreck and ruin so completely that but little is left for the types to do.

Through the effects of the freezing rain storm of the morning ice had gradually collected upon the wires until each one of the great network looked to be nearly an inch in diameter, thus adding tons to the immense load and weight supported by the tall poles along this main thoroughfare. The breeze set the great overhead mass to swinging, when suddenly, without a moment's warning, the weakest pole snapped off in two places as though it were but a pipe stem. A few seconds later and the scene of wreckage was complete, the whole mass falling upon and crashing down the trolley wire of the street rail-

IN THE PATH OF THE STORM, EAST MAIN STREET, LOOKING WEST.

way, and at several places it buried the supply wires of the two electric light companies.

The breaking of poles, snapping of wires, and the thud of the weight upon the pavement made in all a loud and startling noise that could be heard for blocks away.

The police and fire departments were soon on hand, and all electric currents were ordered to be cut off. Manager Platt of the Bell Company had a large crew of linemen, electricians and laborers at work in a short time, who, assisted by the fire department forces, did rapid and excellent work in clearing away the wreckage.

The Bell Company immediately began the work of setting new poles and of re-establishing the service, and put into commission a temporary overhead system, which is to serve until the underground conduit can be con-

A BROKEN EIGHTY-FOOT POLE REVERSED.

structed this spring. All the available men in the city and a large force of workmen from Detroit were employed to repair the three hundred or more 'phones that were rendered useless.

The damage is estimated from six to seven thousand dollars. It was indeed fortunate that the accident occurred just at the time that it did on Sunday morning, when but few were upon the streets, and at an opportune moment when no one was beneath the falling mass. Almost any other time, or upon a week day, the loss of life and injury to pedestrians and travelers upon this thoroughfare would have been tremendous.

It is a noteworthy incident that the Citizens' Telephone Company escaped without the loss of a pole or the breaking of a single wire, and their plant was in full operation throughout the storm, which proved of great convenience to the public in general, and was much appreciated.

AN HOUR WITH THE HELLO GIRL.

Number.

Busy.

Hello!

It is a busy hour, and the central telephone office of the city of Toronto is eyes front, with mouth close to the receiver. I see few faces, but scores of bunches of back hair—golden, brown, or black—all artistically arranged; a strange subdued sound of many voices, a murmuring as of the wind whispering in the trees, making music with the leaves.

Here is where a great city is doing much of its business.

What tales of love have been whispered through this room; what of future happiness! What meetings have been arranged through this room; what tender messages; what grim messages; what hurried calls! What of natural; what of supernatural; what of life, of death—what has it not heard, this murmuring room? What its secrets!

But its voice is close, as close as the grave.

Tell me some of your hidden mysteries. They would make sudden proof that truth is stranger than fiction.

You refuse!

Perhaps well so. You carry the great unknown of Toronto in these wires, in these receivers, in the coils upon coils of wire, in the great jars in the basement below.

And you—Electricity—you, the all-powerful genius, who presides over it all; you who, yet invisible, work as I watch; you even now are quietly and mysteriously bringing thousands together in a twinkling. You hear a number called, and laugh at space. Will you tell your secret?

You, too, refuse!

Before me are the long-distance girls. I bend over; one is whispering:

"Hello, Chicago!"

And Chicago whispers back: "Hello, Toronto!"

Thus a modern miracle is performed.

A husband in Montreal is telling his wife in Bloor street:

"I'll be home on Saturday morning." And she sends him a kiss in a jiff. He receives it in the ear.

Another miracle. And yet the world takes it all as a matter of course.

Little red lights flit above the girls, sometimes glowing like fireflies, then again dying into darkness. The guide explains that when a girl leaves a call unanswered the light burns, but when her connections are made the light dies out.

"Hello!"

"Number?"

"Busy!"

"Yes, it is busy."

"Oh! you did not ring."

"No, you didn't call me."

"Don't ring so hard. I heard you."

"Drop 5 cents in and push the button."

And so it ran in ceaseless rhythm.

The enquiry office consisted of two wise-looking girls, whom the public of Toronto daily deluge with questions, who carry thousands of facts, figures and numbers in their heads, on their fingers' end; who are the Solomons, the Daniel Websters, of the room and their world.

We went down to No. 1000, the "trouble department." As I went in a man said:

"Who are you?"

I started to tell him, but he was talking to a fellow in the West End, who was registering a kick.

Toronto's central telephone office is a great sight in a busy hour.

Woods & Shaw, 225 South Canal Street, Chicago, announce they are prepared to do any kind of telephone construction work. The firm handle telephone apparatus, and make a specialty of interior telephone systems. Correspondence is invited.

ANNUAL ADDRESS OF J. B. WARE,

PRESIDENT MICHIGAN INDEPENDENT TELEPHONE ASSOCIATION.

Read at Lansing, Mich.

The president said in his annual address:

It is with more than ordinary pleasure that I greet you to-day in this our third annual meeting of the association.

This pleasure is the greater owing to the very satisfactory conditions surrounding each of the companies here represented, the gratifying outcome of the year's business, and the growth of the Independents in Michigan and elsewhere, during said period.

When we assembled in Battle Creek one year ago a cloud of uncertainty hung over us, owing to the recent sale, by Detroit and Kalamazoo individuals, of the telephone properties of the

Detroit Telephone Exchange with	5,200 telephones
New State Exchange and lines	4,457 telephones
Central Telephone Company	413 telephones
Kalamazoo Exchange	819 telephones
Total telephones sold	10,889

We cannot too strongly express appreciation of the offer made at our last annual meeting, by the United States Telephone Company of Cleveland, Ohio, to build a 30-foot pole, long-distance toll line, with sufficient copper circuits to adequately handle the toll business from Michigan to Ohio and other states.

Under authority given by you to your executive committee at that meeting, proper, twenty-five-year contracts were secured with a majority of the companies of the state, for an interchange of business, etc., and the United States Company began the construction of the line mentioned from the Saginaw end. The line is completed from Saginaw to Owosso and Lansing, and to Jackson and Manchester, except that the lines in Jackson are not yet built owing to delay in the securing of the franchise, which was not granted until January 21. The line will be completed, however, via Adrian to Toledo before May 1, in all probability.

The United States Telephone Company, besides owning numerous exchanges, including one of some 6,000 telephones in Cleveland, and one of 4,000 in Columbus, owns more miles of toll line and connects with more telephones in Ohio (outside of Cincinnati) than does the Bell licensee companies. These connections will be secured to our Michigan companies over the United States Company's lines before mentioned.

The United States Company has recently secured long-term contracts for Pennsylvania toll connections, via Pittsburg. The toll lines to Pittsburg are nearly completed and by the time the Michigan lines are finished to Toledo connections will have been made with the Pennsylvania city named.

Whatever may have been the expectations regarding the action of our Independent companies one year ago, as a matter of fact, they became more active and aggressive than ever before.

The Citizens' Telephone Company of Grand Rapids, in February, 1900, purchased a majority of the stock of the Muskegon Company, and a few days later formed a consolidation with the Lansing Company. In August it purchased the interest of the Northern Telephone Company, including the Traverse City Exchange and the Leelanaw Company lines. It later built copper circuit toll lines from Cadillac to Manton and Traverse City, thus opening for the first time a very large territory that heretofore had not had any telephone toll service, including Frankfort, Thompsonville, Copemish, Wexford and Sherman.

Like other Independent companies, the Citizens' has connections with many towns not reached by the Michigan-Erie Company. Within a circle around Grand Rapids having a fifty-mile radius the Citizens' Company reaches 231 exchanges and toll stations, while the Erie reaches but 91, an excess of 140 in favor of the Citizens'.

With Ionia as a center, a circle having a forty-mile radius, including all lines west of Lansing owned by the New State Company, and sold as before referred to, at the present time, the following shows all places:

Reached by both	77
Reached by Bell only	9
Reached by Independent only	88
The total points	174

Of the above the following comparison shows present strength:

	Independents.	Bell.
Exchanges	37	13
Toll stations	128	73
Total	165	86

If all New State Company lines and points reached were cut out the result in said Ionia circle would be:

	Independents.	Bell.	Independents' Excess Strength.
Exchanges	33	16	17
Toll stations	105	82	23
Points reached.	138	98	40

Similar conditions exist throughout the Lower Peninsula, outside the Kalamazoo districts. The Citizens' Company has paid regular 2 per cent quarterly dividends for past three and one-half years.

The Union Telephone Company of Alma in February, 1900, formed a coalition with the Montcalm County Telephone Company. It immediately began the development of the Central Michigan territory.

In the territory covered by the Union Telephone Company its relative strength, compared with the Michigan Company (Erie-Bell) is as follows:

Points reached by both	46
Points reached by Bell only	1
Points reached by Union only	37
	84

	Exchanges.	Toll.	Telephone.
Union	19	42	954
Bell	3	20	176
Excess Union Co	16	22	778

The Kalamazoo and Detroit companies had no telephone property in Union territory and Bell interests have made no purchases therein.

The Union Telephone Company is out of debt and pays 8 per cent cash dividends

During the year the Union Telephone Company built exchanges in Mt. Pleasant, Shepherd, Harrison, Merrill, Breckinridge, Carson City and Lakeview; it connected Saginaw, its eastern terminus, by heavy copper circuits via Alma with Howard City on the Citizens' system; also ran copper from Alma to Mt. Pleasant, Clare, Harrison and Farwell.

The Citizens' Telephone Company of Evart, in turn, built copper lines from Marion to Evart and then to Farwell, thus connecting with the Union Company on the east and the Citizens' of Grand Rapids at Evart on the west.

The Moore Company at Caro has put up considerable metallic toll lines and several exchanges in the Thum territory.

The Valley Company, covering the commercial center of eastern Michigan, while not extending its borders, has had an increase of over 300 telephones in its Bay City, Saginaw and Flint exchanges. It has more business telephones in each exchange than has the Erie-Bell, and is

giving extra fine service to its patrons, which is far more than its Bell competitor can or does claim.

The Owosso, St. Johns and Benton Harbor companies have each prospered financially and increased numerically, and each is furnishing A1 service and each is greatly superior numerically to the Erie-Bell competitor in its territory.

Adrian has put in a fine new switchboard, built an exchange at Palmyra and has done, as we would have expected, its full share. It has paid 4 per cent semi-annual cash dividends from date of organization.

The Oceana County Company (Hart) has extended its lines to Ludington and is building an exchange there. It reaches 39 places in its territory, while the Michigan Bell reaches but ten places.

The West Michigan Company at Allegan has not been contented to have 165 telephones in Allegan with the Bell twelve, but has secured a franchise at Otsego and is now building an exchange to replace the one the Kalamazoo Company sold to the Erie one year ago. It is a private corporation and its profits are entirely satisfactory to its owners.

In the old Detroit territory, trouble has begun for the Erie Company. Mr. J. W. Martin promoted a company at Pontiac, and not only has built and has in operation there an exchange of some 370 telephones (about equal to both New State and Michigan Bell exchanges), but has built an exchange at Holly and also toll lines between said exchanges and to the Independent exchanges of Oxford on the northeast, Northville and Plymouth on the south, and to Rochester on the east. Mr. Martin has recently secured a franchise for an exchange in Detroit, and in ten days signed subscribers for 3,800 telephones, proving conclusively that even if the Detroit people were betrayed once, they stand ready to support another Independent exchange. It not only promises reasonable rates, but with common honesty and the same care as shown by the Independents of the state, a new exchange at Detroit can furnish first-class service, and that is something Detroit has not yet had.

Other companies in various parts of the state should be mentioned if time permitted. As explaining why these selections are made, I will state that no formal reports have been received from all the various companies, and I have given only the information which has come to me from reliable sources.

The Erie Telephone Company's policy is, "The stifling of competition by expansion." Probably no greater effort has ever been made under this policy than by the Erie Company in Michigan during the past year. It has been worked without regard to cost of rebuilding, cost of construction, cost of operation, or rental charges for exchange service. The policy has failed in Michigan, and I understand has proven a failure in other states.

The only places where competition has been prevented, as far as I now recall, is in Albion, Marshall and Portland, in each of which places residence rates were fixed at $6 and are maintained to this day. At Portland and Lowell, in addition to the $6 residence rate, a $12 business rate was made and still continues.

At Lowell, in spite of the Erie having 154 telephones, the Citizens' Company had the temerity to attempt to establish an exchange at higher rates. Starting with 32 telephones, the exchange has constantly grown until it numbers 90 telephones, with every indication of permanency and supremacy.

At Hastings, with the Bell exchange of 54, a $6 residence rate was made to keep out the Citizens' Company, and two professional solicitors canvassed the town for nearly three weeks, increasing the Bell subscribers to 74. In ten days one individual, assisted by the local manager, secured 75 contracts at $4 higher residence rates, and the Citizens' exchange was built. To-day the Citizens' Company has 204 telephones in service there and the Erie-Bell has about a dozen free 'phones.

The business people of Michigan do not want or expect less than cost telephone service. They have every reason to believe that an era of exorbitant rates would follow the driving out of the Independents and would also restore the poor service of the Bell Licensee Company. And yet less than cost service has greatly increased the number of Bell telephones in Michigan, as shown by the following figures:

January 1, 1897	15,025	telephones
January 1, 1898	16,270	"
January 1, 1899	19,539	"
January 1, 1900	32,231	"
July 1, 1900	42,500	"

This increase is largely residence telephones at less than average cost of operation and maintenance.

What is the ultimate effect of the Erie policy? As frequently pointed out it means bankruptcy. In many places in Michigan the exchanges of the Erie Company receive less income than the actual operating expenses, even when not including interest on bonds, dividends, royalties, general office and Lowell expenses, etc.

In Grand Rapids the Erie's exchange has not paid expenses of operation alone for over four and a half years. Its rates are $12 for residences and $24 for business 'phones anywhere within the city limits. For the year 1900 the operating expenses in Grand Rapids of the Bell exchange exceeded the rental income by more than $20,000, in my judgment, and the statement is not contradicted, though frequently made.

The absolute loss in operating Michigan Bell exchanges in Muskegon, Benton Harbor, Battle Creek, Portland, Lowell, Saginaw, Bay City, Owosso, Charlotte, and numerous other places is known to those present and explains in part at least the recent financial troubles of the Erie Company.

I will not worry you with a review of the Erie Company's financial troubles of the past twenty days, which are known to us all, except to recall to your attention that one year ago Erie stock was selling at 122 and Michigan stock at about 90. Now Erie stock finds little or no sale and is quoted at from 55 to 67, while Michigan stock finds no sale at quotations of 69. Quotations are only made in Boston. It seems that, like the old wildcat money of Michigan, the farther away from the state one goes, the more valuable the property. The contrast with the conditions of one year ago, however, presents a picture to our minds not soon to be forgotten. The present thus finds in this state, and other states, two vast telephone interests, heretofore antagonistic. In view of the past exclusive policy dictated by the American Bell Company to its licensees, an interchange of business between the Bell Companies and the Independents was impossible.

If the lesson of past experience has been properly understood, it is my judgment that new policies should be adopted. One policy is outlined in an article appearing in the Michigan Tradesman (Grand Rapids) of January 23, entitled "Rational Solution of the Telephone Situation." Unless a solution is found resulting in a reasonable interchange of business, I predict the final ruin of the Bell Company's interests in this state, and that at no distant day.

The Bell movement wanes—the Independent grows naturally. Everywhere are proofs of prosperity among the Michigan Independents. Not one has failed during the past four and one-half years, and a number not already mentioned are paying quarterly and semi-annual cash dividends. Nothing but good to the people has come out of the Independent movement, and without question they will continue to support it, as in the past.

From the report of the tax commission to the state it appears that there are 22,000 Independent telephones in the state.

THE EVOLUTION OF THE TELEPHONE.

BY H. S. COYLE.

The Buffalo Commercial Advertiser of 1876 describes a wonderful invention called Craighton's Oral Annunciator which was at that time being installed for a local hotel. This instrument affords the direct means for oral communication between the office and each room in the hotel. It is operated by the breath and voice, a puff of breath through the speaking tubes drops a shutter on the board in the office, which indicates the number of the room, the act of dropping the shutter rings a bell, which will continue to ring until the call is noticed. It is said that conversation can be readily carried on in a low tone or whisper through such an instrument for more than three hundred feet. This will not appear incredible in view of the fact that Prof. A. Graham Bell, of the Boston University, is now able, by means of his speaking telephone, to carry on, with perfect ease, conversation over a line established between his rooms in the university and the Cambridge Observatory, a distance of eight miles.

It would be a long, but a beautiful, story to tell how through a long course of evolution the tubes of Craighton's Annunciator were superseded by copper wire, and how a puff of breath was replaced by a current of electricity, and how the drop on Craighton's primitive switchboard, through a long course of inventions, was succeeded by the drop on the modern switchboard, and how the continuous ringing of a bell was superseded by the night alarm lamp, the supervisory systems, the buzzer and many other devices for attracting attention.

Let us return for a few moments to the cradle of humanity. Every invention of any importance is the nursery of future inventions, the cradle of a sleeping Hercules.

Only now and then the angry sky was lighted for the primitive man by electricity, and even then it filled him with terror. But it was he that invented the apparatus for conjuring from dried wood, by a rude sort of dynamo, the Promethean spark.

In the time of which we are now writing communication at a distance was carried on by a series of signal fires, and a marvelous code of signs. The way from the camp fire signals to the modern method of communication is long, but all the steps of that way have been taken in the endeavor of mankind to secure greater happiness and comfort.

How many test coils, transmitters, receivers, relays, etc., were devised! How many that were good yesterday are superseded by those that are better to-day! It is the survival of the fittest by human selection. Invention has struggled with invention for existence through human agency, and the many have been sacrificed that the few—the best—might remain as monuments of glory to the inventor. Through all the course of human history man has sought to communicate with his distant brother, so he invents camp fire signals, he sends rockets into the night, and many and wonderful are the methods that he devises to accomplish his desires.

The early forms of telephone apparatus are very simple. One of the earliest inventions was the following: A crude receiver is placed in circuit with a battery and two pencils of carbon are placed point to point, when the resistance of the current is varied by pressing the points of the carbon together a harsh grating sound is heard in the receiver. The microphone is an instrument for augmenting small sounds; one of the simplest forms of microphone consists of a piece of charcoal held between two other pieces of carbon, and in such a manner as to be affected by the slightest vibrations carried to it by the air or any other medium. The external pieces being put into circuit with a battery, and a receiver held at the ear, "the sounds caused by a fly walking on the wooden support of the microphone appear as loud as the tramp of a horse." Through a long course of inventions the modern receiver and transmitter were evolved out of the simple inventions described above. So the old grows into the new by the survival of the fittest.

The one endowment that early man possessed having in it the promise and potency of all future achievements, was the creative spark called invention.

We learn from the records of the ages that there never was a time when man was not an inventor—never a time when he had not some sort of patent on his inventions. All inventions had their origin in the cradle-land, and in the infancy of our race. What we enjoy is only the full-bloom flower, the perfect fruit of which they possessed the germ. Many years ago men sat down and with great pains and sorrow invented the principles which make our telephone a possibility.

It was a struggle through aeons of time by which the forces of destruction became a beneficent agent in civilization. How terrible is the lightning stroke! In its history how many limbs has it rent asunder, how many groans of agony have gone up to heaven, how many shrieks of terror have rent the air! Is it not strange that the genius of man has transformed the very lightning of destruction into a messenger of love and joy? So the good grows out of the evil, and the force of destruction carries messages of tender love and joy, messages of sorrow and messages about everything in life, and the speech of man trembles over a net of wire in every city of the land. From the dawn of human culture in savagery, to the midday of culture in civilization, human genius has been producing many inventions for many purposes, and the good have given place to the better, and the better have yielded to the best. The problems of the telephone are not all solved, though savage inventors and barbaric inventors and civilized inventors in all lands and in all times have sought to produce the best invention. And so inventions have been changing, old inventions have died out and new inventions have been born, and inventions have struggled for existence as man has endeavored to learn; and with man forever the struggle to know has been the endeavor to secure happiness, for truth is good and wisdom is joy.

The telephone will no longer be an expensive luxury in London. The new scale of charges will bring it within the reach of all, so that in time the house without an instrument will be the exception rather than the rule. There will be alternative methods of getting the telephone installed. In the one case a lump sum will be paid annually for the inclusive use of the whole metropolitan system. This will no longer be £20, but a rental which, although it has not been finally determined, will not be greater than £10, and may be rather less. But probably the more popular way of subscribing will be on the "toll service." Under this method the subscriber pays a small initial sum—about £3—and then a penny per call for every time he rings up, and nothing, of course, when he is rung up. One effect of this method will be to make the majority of shops into public call offices. For the tradesman, paying a penny per call, will probably permit customers to use his instrument at, say, 2 pence per call, making it pay for itself possibly two or three times over during the year.

P. W. B. writes that he is having a great deal of trouble with induction from a power magneto used for ringing and wants to know how to get rid of the trouble.

If the trouble is due to induction and not leakage a very simple way is to bridge a two-microfarad condenser across the terminals of the machine. This class of machines frequently is the cause of such trouble and the condenser is the usual cure.